

JOURNAL *of the* **American Veterinary Medical Association**

Formerly AMERICAN VETERINARY REVIEW

(Original Official Organ U. S. Vet. Med. Assn.)

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Vol. XCII, N. S. Vol. 45

March, 1938

No. 3

BANG'S DISEASE CONFERENCE

There will be a North Central States Bang's Disease Conference along informational, educational and policy-forming lines at the Lowry Hotel, Saint Paul, Minn., March 28-29, 1938. This meeting is being sponsored by the live stock breeders and live stock sanitary officials of Minnesota and Wisconsin. Other states to be represented include North Dakota, South Dakota, Iowa, Illinois, Indiana, Ohio and Michigan.

A committee consisting of Mr. J. S. Jones, secretary of the Minnesota Breeders Association; Dr. Charles E. Cotton, secretary and executive officer of the Minnesota State Live Stock Sanitary Board; Mr. Arlie Mucks, secretary of the Wisconsin Live Stock Breeders Association; Dr. Walter Wisnicky, Director of Live Stock Sanitation, Wisconsin Department of Agriculture and Markets; Dr. C. P. Fitch, Chief, Division of Veterinary Medicine, University of Minnesota; Dr. James S. Healy, B.A.I. inspector-in-charge of Wisconsin and Dr. W. J. Fretz, B.A.I. inspector-in-charge of Minnesota, are arranging the program for the conference.

It is hoped that the conference will attract prominent cattle-breeders from the North Central States, as well as live stock

sanitary officials, live stock marketing interests, extension workers, officers of farm organizations, and practicing veterinarians, all of whom should be vitally interested in the future of the Bang's disease control program.

EXHIBITS

About a year ago, the American Veterinary Medical Association launched a project for holding two educational exhibits during 1939, one at the World's Fair in New York City and the other at the Golden Gate International Exposition in San Francisco. The success of the undertaking was contingent on the financial support given by the profession throughout the country with the state associations acting as the links between the individual veterinarians and the mother organization. As a result of the efforts put forth during the last year, 21 state associations voted a total of \$1,765.00 toward the project. Of this amount, \$1,180.00 was actually paid into the treasury of the American Veterinary Medical Association.

While the money was being collected, negotiations were being conducted with the officials of both expositions, with a view to ascertaining what the cost would be. These investigations indicated that it might require upwards of \$30,000.00 to finance two exhibits. As there was absolutely no prospect of being able to raise this sum of money and install the exhibit along the lines originally planned, the Executive Board has decided to give up the original idea and return the \$1,180.00 that had been contributed by the 21 state associations. New plans are being developed with a view to seeing what can be done in the way of having an exhibit at the World's Fair in New York City next year. As these plans develop, announcements will appear in the JOURNAL from time to time.

EXECUTIVE BOARD ELECTIONS

The regular elections for members of the Executive Board in Districts 2 and 3 have been in progress since January 5. Members of the A. V. M. A. in these two districts have been casting their nominating votes in the primary elections which will come to a close on March 5. As soon as possible after that date, the ballots for the elections proper will be prepared and mailed to all paid-up members in the two districts. The states of Penn-

sylvania, New Jersey and Delaware constitute District 2, and the states of Wisconsin, Illinois and Indiana constitute District 3. There are slightly less than 400 members in District 2, and approximately 450 members in District 3. The polls for the elections proper will remain open until May 5.

APPLICATIONS FOR MEMBERSHIP

This month first listing is being given to 18 applications for membership filed during the month of February. The interesting part about these 18 applications is that they were received from veterinarians located in 13 different states, from Maine to Texas and from Florida to Washington. We had hoped to be able to list a larger number this month, but quite a few of our prospects failed to materialize. We hope to be able to publish their names next month.

(See January, 1938, JOURNAL)

FIRST LISTING

- BECTION, LEE M. 15 Virginia Ave., Staunton, Va.
D. V. M., Alabama Polytechnic Institute, 1933
Vouchers: H. D. Pritchett and H. R. Clemmer.
- BROCK, CONWAY C. Lake City, Fla.
D. V. M., Alabama Polytechnic Institute, 1937
Vouchers: R. L. Mundhenk and J. E. Greene.
- CREEL, BEN W. c/o Board of Health, Mobile, Ala.
D. V. M., Alabama Polytechnic Institute, 1925
Vouchers: J. E. Greene and R. L. Mundhenk.
- ELIASON, THEODORE R. 3632 Park Ave., Minneapolis, Minn.
B. V. Sc., Ontario Veterinary College, 1935
Vouchers: Joab P. Foster and John S. Dick, Jr.
- HOWELL, WILLIAM M. Alabama Polytechnic Institute, Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1909
Vouchers: R. L. Mundhenk and J. E. Greene.
- IVENS, WILLIAM H., JR. 60 Haverford Rd., Ardmore, Pa.
V. M. D., University of Pennsylvania, 1934
Vouchers: Wm. J. Lentz and F. E. Lentz.
- NEAL, ALLAN J. 324 Essex St., Bangor, Me.
D. V. M., Kansas City Veterinary College, 1917
Vouchers: J. F. Witter and P. R. Baird.
- PINCKARD, WENDELL L. 312 W. Church St., Knoxville, Tenn.
D. V. M., Alabama Polytechnic Institute, 1937
Vouchers: M. Jacob, O. V. Brumley and R. L. Mundhenk.
- REMER, F. B. Havre, Mont.
M. D. C., Chicago Veterinary College, 1908
Vouchers: W. J. Butler and H. F. Wilkins.
- RITCHIE, KENNETH L. c/o County Agent's Office, Blackfoot, Idaho
D. V. M., Iowa State College, 1933
Vouchers: Paul S. Hannah and Phil H. Graves.

- RUSS, ROBERT S. 614 Post Office Building, Portland, Ore.
B. S., D. V. M., State College of Washington, 1937
Vouchers: J. W. Harrison and Sherman L. Brown.
- STARNES, ROBERT E. 817 W. Davis St., Dallas, Texas
D. V. M., Texas A. & M. College, 1931
Vouchers: M. B. Starnes and L. E. Casey.
- STRASBURGER, RUSSELL F. Box 244, Newtown, Conn.
V. M. D., University of Pennsylvania, 1936
Vouchers: E. H. Patchen and Philip H. Gerlach.
- THAMES, C. B. Greenville, Ala.
D. V. M., Alabama Polytechnic Institute, 1927
Vouchers: Louis E. Beckham, W. N. Castleberry and R. L. Mundhenk.
- WALKER, ERLING H. Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1930
Vouchers: R. L. Mundhenk and J. E. Greene.
- WATSON, LT. EDWARD J. Fort George Wright, Spokane, Wash.
B. S., D. V. M., State College of Washington, 1937
Vouchers: Capt. Harvie E. Ellis and Col. A. L. Mason.
- WILLARD, HORACE R. 1601 N. Ballinger St., Fort Worth, Texas
D. V. M., Texas A. & M. College, 1937
Vouchers: M. B. Starnes and T. O. Booth.
- WINTERS, EVERETT S. Alabama Polytechnic Institute, Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1918
Vouchers: R. L. Mundhenk and J. E. Greene.

Applications Pending

SECOND LISTING

(See February, 1938, JOURNAL)

- Allen, Fred E., 1593 Hunter Ave., Columbus, Ohio.
- Attaway, Ray S., Box 168, Princeton, Ky.
- Barchfeld, William P., 711 James St. N. S., Pittsburgh, Pa.
- Baxter, Ernest C., 816 S. San Pedro St., Los Angeles, Calif.
- Becker, H. Robert, 514 S. George St., York, Pa.
- Burgess, Stokes H., 605 N. 5th St., Mankato, Minn.
- Burton, Jared, Wheaton, Minn.
- Clausen, Lawrence B., 1285 Sigel St., Saint Paul, Minn.
- Collins, Lt. Horace R., Jr., Fort Oglethorpe, Ga.
- Earhart, Robert N., 42 Sheridan Ave., Fort Thomas, Ky.
- Fisher, B. O., Great Falls, Mont.
- Fisher, Virgil H., Great Falls, Mont.
- Fisher, Vurl E., 1323 E. Center St., Rochester, Minn.
- Gathmann, Lt. Raymond A., Fort Oglethorpe, Ga.
- Hoggan, Robert W., 1285 Parkway Ave., Salt Lake City, Utah.
- Jennings, Charles G., Morris, Minn.
- Jones, Leland W., 156 E. 4th St. N., Provo, Utah.
- King, John M., 222 N. 3rd St., Apt. 9, San Jose, Calif.
- McFadden, Glenn M., Box 731, Daytona Beach, Fla.
- McGilvray, C. Leroy, 183 Eglinton Ave. W., Toronto, Ont.
- McKay, John, Sr., 2326 W. 2nd St., Duluth, Minn.
- McLean, Robert T., 3684 Beverly Blvd., Los Angeles, Calif.
- Maurer, Fred D., University of Idaho, Moscow, Idaho.
- Opp, Albert L., Box 3032, Cristobal, Canal Zone.
- Paul, Lt. Emmet W., 125 1st Ave., Salt Lake City, Utah.
- Peters, John E., 11 Forest Ave., Arcadia, Calif.

Poley, Linn S., 2004 E. Quarrier St., Charleston, W. Va.
Quortrup, Erling R., Bear River Bird Refuge, Brigham, Utah.
Raven, Howard C., 730 Hibbard Rd., Wilmette, Ill.
Riede, Peter H., Mabel, Minn.
Roberts, Irwin H., Box 55, Yadkinville, N. C.
Rockey, William H., 430 College St., Woodland, Calif.
Root, Robt. R., Livermore, Calif.
Saturen, Israel M., 309 N. Marshall St., Philadelphia, Pa.
Stock, Leslie E., Kensington, Minn.
Taylor, C. Edward, 230 State St., San Mateo, Calif.
Upton, John R., 660 Fairview Ave., Arcadia, Calif.
Weber, Claud M., Oakville, Ind.
Westfall, John H., Bristol, N. H.
Wilson, Warren S., Buffalo, Minn.
Young, Clarence C., Box 131, Nacogdoches, Texas.

The amount which should accompany an application filed this month is \$9.16, which covers membership fee and dues to January 1, 1939, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

- Northwestern Ohio Veterinary Medical Association. Hotel Waldorf, Toledo, Ohio. March 10, 1938. Dr. C. W. Witty, Secretary, Elmore, Ohio.
- Ak-Sar-Ben Veterinary Medical Association. Fontenelle Hotel, Omaha, Neb. March 14, 1938. Dr. J. D. Ray, Secretary, 1124 Harney St., Omaha, Neb.
- Southern California Veterinary Medical Association. Chamber of Commerce Building, Los Angeles, Calif. March 16, 1938. Dr. B. B. Coale, Secretary, 203 Administration Bldg., Union Stock Yards, Los Angeles, Calif.
- Kansas City Veterinary Association. Auditorium, General Hospital No. 1 Annex, Kansas City, Mo. March 20, 1938. Dr. C. W. Schulz, Secretary, 800 Woodswether Rd., Kansas City, Mo.
- San Diego County Veterinary Medical Association. Zoölogical Research Building, Balboa Park, San Diego, Calif. March 20, 1938. Dr. E. F. Sheffield, Secretary, 3895 Pacific Blvd., San Diego, Calif.
- Keystone Veterinary Medical Association. School of Veterinary Medicine, 39th St. and Woodland Ave., Philadelphia, Pa. March 23, 1938. Dr. C. S. Rockwell, Secretary, 4927 Osage Ave., Philadelphia, Pa.
- Massachusetts Veterinary Association. Hotel Westminster, Boston, Mass. March 23, 1938. Dr. H. W. Jakeman, Secretary, 44 Bromfield St., Boston, Mass.

American Animal Hospital Association. Mayflower Hotel, Washington, D. C. March 24-26, 1938. Dr. D. A. Eastman, Secretary, 901 Nineteenth St., Moline, Ill.

Maine Veterinary Medical Association. University of Maine, Orono, Me. March 31, 1938. Dr. A. E. Coombs, Secretary, 1 Kennebec St., Skowhegan, Me.

Southern California, Veterinary Hospital Association of. Los Angeles, Calif. April 5, 1938. Dr. L. B. Wolcott, Secretary, 1434 W. Slauson Ave., Los Angeles, Calif.

New York City, Veterinary Medical Association of. Hotel New Yorker, 8th Ave. and 34th St., New York, N. Y. April 6, 1938. Dr. J. B. Engle, Secretary, Box 432, Summit, N. J.

Saint Louis District Veterinary Medical Association. Melbourne Hotel, Saint Louis, Mo. April 6, 1938. Dr. Milton R. Fisher, Secretary, 3678 Dover Pl., Saint Louis, Mo.

Houston Veterinary Association. Houston, Texas. April 7, 1938. Dr. Claude Canion, Secretary, 409 Link Rd., Houston, Texas.

Chicago Veterinary Medical Association. Hotel Sherman, Chicago, Ill. April 12, 1938. Dr. O. Norling-Christensen, Secretary, Box 12, Wilmette, Ill.

Southeastern Michigan Veterinary Medical Association. Medical Arts Building, 3919 John R. St., Detroit, Mich. April 13, 1938. Dr. F. D. Egan, Secretary, 17422 Woodward Ave., Detroit, Mich.

Southwestern Minnesota Veterinary Medical Association. Saint James, Minn. April 26, 1938. Dr. Louis E. Stanton, Secretary, Jackson, Minn.

American Veterinary Medical Association. Hotel Pennsylvania, New York, N. Y. July 5-9, 1938. Dr. H. Preston Hoskins, Secretary, 221 N. La Salle St., Chicago, Ill.

AMERICAN ANIMAL HOSPITAL ASSOCIATION

The fifth annual meeting of the American Animal Hospital Association will be held in Washington, D. C., March 24-25-26, 1938. Headquarters will be at the Mayflower Hotel. Dr. S. W. Haigler, President, of Saint Louis, Mo., and Dr. D. A. Eastman, Secretary, of Moline, Ill., have arranged a program that should prove to be very interesting to veterinarians engaged in small-animal practice. If you have not received a copy of the program, Dr. Eastman will be very glad to send you one.

Report of the Proceedings
of the
Forty-First Annual Meeting
of the
United States Live Stock
Sanitary Association

Chicago, Ill., December 1-3, 1937

WEDNESDAY MORNING, DECEMBER 1, 1937

The opening session of the forty-first annual meeting of the United States Live Stock Sanitary Association, held at the Hotel La Salle, Chicago, Illinois, December 1-3, 1937, convened at 10:15 a. m., Dr. R. W. Smith, president of the Association, presiding.

PRESIDENT SMITH: Members of the Association, Ladies, Guests and Friends: We have met here in our forty-first conference, and in order that we may proceed in an orderly way, the Chair will entertain a motion to conduct the meeting from now on according to the printed program, rather than follow our Constitution and By-Laws. That means we will change the order somewhat.

DR. J. L. AXBY: I move that the regular order be dispensed with and that we proceed according to the printed program.

. . . . The motion was severally seconded, voted upon and carried unanimously.

PRESIDENT SMITH: You will note that our opening address is to be given by Dr. Maud Slye. There are still a few members drifting in at the door, so in order that we may all be present to hear Dr. Slye's address, we shall reverse the order of business and will call for the report of our Secretary-Treasurer. Dr. L. Enos Day will now read his report.

. . . . Dr. Day presented his report. . . .
(See Appendix A, p. 479.)

SECRETARY DAY: Mr. President, it is customary for you to appoint an Auditing Committee to audit the financial report of the Association. Therefore, I suggest you appoint such a committee now, so that they may make their report at the first meeting of the Executive Committee, which will be held tomorrow afternoon.

PRESIDENT SMITH: I shall make that appointment the first matter of business on the program this afternoon.

Gentlemen, you have heard the report of the Secretary-Treasurer. What is your pleasure?

DR. C. P. FITCH: I move its acceptance, and include in my motion that the report be referred to the Executive Committee for further action.

. . . . The motion was severally seconded, voted upon and carried unanimously.

PRESIDENT SMITH: We will continue with the program.

Each year, we make ready to come to this conference with a great deal of pleasure and with the anticipation that we are going to renew our acquaintances as well as take up subjects in which we are interested; but, there is always the other side to the matter.

We know that when we arrive here, there are a few faces, many of which we have seen for a long while, which are going to be missing. We know that some of our members have passed to the Great Beyond, and that they will never return to take part in these sessions again.

It is entirely fitting and proper that we should pause and pay our respects to these departed members and conduct a memorial service to them. I have asked Dr. J. L. Axby, of Indiana, to conduct this service, and he has kindly consented to do so. We will have our Memorial Service at this time.

MEMORIAL SERVICE

DR. J. L. AXBY: Mr. President and Members of the Association: The following names comprise the list of members who have passed to their final reward during the past year:

Dr. Ezra Strickland Deubler, Penhurst Farms, Narberth, Pennsylvania. Born, April 20, 1879; died, March 2, 1937.

Dr. Charles Edgar Poe, Hagerstown, Maryland. Born, 1869; died May 2, 1937.

Mr. Joseph H. Mercer, Topeka, Kansas. Born, 1864; died, May 5, 1937.

Dr. William Henry Dreher, Oregon, Wisconsin. Born, 1885; died, July 27, 1937.

Pursuant to our established custom, I respectfully call upon all present to rise, remain standing for one minute, and with bowed heads, offer a silent prayer in behalf of our deceased brothers.

One minute of silent prayer. . . .

I know of no more significant memorial service than to speak kindly of these men, and abstract from their lives such characteristics as are singular and noteworthy, trusting we of today and future posterity may simulate their noble attributes and be better able to advance and solve the hidden secrets of Providence and nature and a free democracy.

These men possessed such qualifications as will prove "genius is no snob" and does not run after titles or seek by preference the high circles of society.

Their lives clearly demonstrate they appreciated that in this country and esteemed Canada, where the rough and ready understanding of the people is sure to be the controlling power, a profound common sense is the best genius for any man.

They further demonstrated that they understood that the commands of country and profession are as imperative as its privileges and opportunities are wide and generous.

In memorializing them, I become obsessed with the thought that we are not worthy to stand here unless we, as they, be in deed and in truth servants of mankind, ready to do all in our power for justice, freedom under the law, scientific advancement, and sanitary science. They forgot self so entirely in the object sought that mere contact or stated proposition received the hearty approval of their countrymen, always addressing the intelligence of men, never their prejudices, their passions, or their ignorances.

The dignity of their lives owes nothing to any ceremonial garb of words, but much to the manly movement that comes of settled purpose and an energy of reason, and to attempt to embellish such dignity after death would be but to dramatize and distract.

"'Tis true, 'tis certain, man tho dead, retains part of himself; the immortal mind remains."

Furthermore, "Great lives do not go out; they go on."

May we emulate the dignity of their lives, revere their memory and be willing to practice their life's portrayal, stated as follows:

*"What in me is dark, illumine,
What is low, raise and support;
That to the heights of this great argument
I may assert eternal Providence,
And justify the ways of God to men."*

Mr. President, I move a copy of this service be sent to the family of each deceased member.

PRESIDENT SMITH: There is a motion before the house to accept this Memorial Service and send a copy of it to the family of each of the deceased members.

. . . The motion was severally seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: Each year it has been the custom for this Association to obtain the service of some outstanding person who has carried on original research or other work pertaining to the subjects in which we are interested, and this year is no exception. We feel that we are fortunate in bringing to you and to this Association Dr. Maud Slye, Associate Professor of Pathology and Director of the Cancer Research Laboratory at the University of Chicago.

As I understand it, Dr. Slye has spent about thirty years in this research work, during which time she has experimented with and tabulated approximately 150,000 mice. She will probably tell us of this in her address.

Dr. Maud Slye. (Applause)

. . . Dr. Slye presented her paper. . . .

THE GENETICS OF CANCER IN MICE

By MAUD SLYE, Chicago, Ill.

*Cancer Laboratory and Department of Pathology,
University of Chicago*

I have been asked to present some of my most recent work to this Association and its guests. As breeders of ever finer stock, you have long been aware of the basic facts of heredity; and just insofar as you have used them knowingly or even unknowingly, have you been able to produce these superb members of the world of animals. Thus you are the first group ever to make practical use of the facts of mammalian heredity. I think much honor is due you for this vision, and that you have been an example which the entire medical profession would do well to follow.

But even while you were raising better animals, you have in most cases, like the rest of the world, been totally unaware of the vast experiment in human genetics going on everywhere—of which you inevitably are a part. You have records of your

stocks and you are guided by them, but we have made no records of this greatest of all experiments—the making of humanity. We have made finer animals for man's use, new powerful tools for his material advantage, but we have given little attention to what breed of men would use them.

I am therefore calling your attention to this experiment in the genetics of cancer, which afflicts mice and stock animals, but which afflicts man most of all. The results of these experiments in the genetics of cancer are primarily of interest in the avoidance and the final elimination of this most dread disease. But they may well be taken as a model of what might be done toward the elimination of all diseases, physical and mental; for every disease that occurs in mice has been shown in my laboratory to have hereditary bases. By following the laws of heredity, it has been possible for me both to breed into a family and out of a family every one of these diseases.

In regard to my own work, it would perhaps interest you first, to take you in imagination through a cancer research laboratory, to show you something of what is learned therein, and its application to the human cancer tragedy.

In the first place, complete sanitation is maintained, with the result that in a laboratory which houses about 10,000 mice at any one time, there has never been an epidemic of any sort whatever, during the 30 years of its existence. Every mouse in the laboratory is put into a sterile cage once a week. Thus we do not need to cure epidemics because we do not let them happen. So, when you enter the laboratory, you see row upon row of inhabitants, living in perfectly sanitary quarters. You enter a world where the mice are kings, and we workers of secondary importance; a world where mice live out their natural lives without interference of any sort. No cancers or other diseases are ever induced here by any artificial means, but these diseases occur spontaneously in the natural course of the lives of the mice, just as they do in the human race; that is why it is of value to study them. Every effort is made to prolong healthy life as far as is possible for every animal. Except for personal quarrels between males with which I have nothing to do, life in this little world of mice is happy and content. They bear their babies without difficulty or pain, they nurse them faithfully, and bring them to adolescence strong and vigorous.

Every mouse is on record from birth until death, and all his ancestors are on record for over 100 generations. Thus we know what lies behind every mouse; we know what diseases he is likely

to have, and whether or not he will recover from them. We know how old he will live to be, and of what he will finally die. We could know this about human beings.

In order to make this study, which in reality is a study of heredity (and of environment), we must make every environmental condition identical for every mouse. The housing of every mouse is identical; the diet is identical; they all breathe the same air, which is kept as free as possible from dust, and live under the same conditions in every respect. You thus can see that in my laboratory, with every environmental factor under control and identical for every mouse, the tremendous differences in cancer occurrence, in different strains of mice, are due to heredity alone.

DIET

The diet of the mice is a simple diet. They do not overeat; they do not have cocktail parties, nor do they indulge in coffee, tea, condiments, or richly cooked foods. Their diet consists of fresh white bread, whole milk doubly pasteurized, mixed birdseed and timothy hay. I have for many years been trying to raise a strain of mice upon which I could test hot food and hot drink, overseasoned foods, and over-eating and drinking. But so far I have not been able to do this. The diet of man, including these three properties, kills any mouse I have ever tried it on. Mice do not smoke or otherwise use tobacco. These things may have some bearing upon the fact that cancers of the mouth, stomach and intestines are unusual in mice, while in man they are among the most frequent malignancies. But the fact that my mice are not in general by heredity susceptible to cancers of those organs, is the chief explanation of their absence.

Two great facts emerge from these studies, which I think will revolutionize human and medical practice when they are generally accepted. First, by selective breeding it is possible to lengthen very greatly the span of vital life. For example, in nature the average life-span of a mouse is about two months. In my laboratory there are many families every member of which lives to be between two and $3\frac{1}{2}$ years old, although mice of nine months are called old by many workers. These mice two and three years old are regular Methuselah mice, and they are strong and well until their final illness, which is predictable. We have practically eliminated infant mortality; we have no childhood or adolescent mortality; every individual of these families lives out his full span of life well and happy.

The other great fact is that all diseases that occur in mice can be ruled out by selective breeding through knowledge of heredity, that is, pneumonia and all other infections of mice, heart disease, Bright's disease and cancer. All of these results have been achieved in the laboratory. They could be achieved for humanity. Some of the families of mice in the laboratory have been completely exempt from cancer of any type or any location for over 28 years. In terms of human life, this would mean complete freedom from cancer in man for over 3,000 years.

The future war against cancer and against all other diseases will, I think, be based not only upon an ever deeper and broader knowledge of medical procedures. It will also be based upon a new and scientifically exact knowledge of the patient. This new contribution will be made by the science of genetics which heretofore has not influenced the art of medical practice of the making of humanity.

GENETICS OF CANCER

The 30 years of study of cancer in this laboratory has culminated in an exact demonstration of the genetics of cancer and its localization. This is the first reported study of the genetics of the localization of malignancy, which has always been considered as part of malignancy itself and inseparable from it. For example, we have spoken of cancer of the breast as though it were one entity, whereas it is now shown to be controlled by two separate hereditary genes, one for carcinoma and one for breast localization, and only where both of these two genes are present does carcinoma of the breast occur; conversely, by the absence of either of these two genes, breast carcinoma can be prevented. So with all other types and sites of malignancy, that is, bone sarcoma, lung carcinoma, hypernephroma, and so on. For the occurrence of spontaneous cancer, there must always be present both the factor for malignancy and the factor for localization. The absence of either of these two factors can prevent cancer. Moreover, the basic three types of malignancy have heretofore been studied as though they were genetically controlled by the same factor, whereas each is controlled by a separate factor, that is, one factor for carcinoma, one for sarcoma and one for leukemic disease.

We all have it in our power to use or to reject this new knowledge. Let me review it for you again, and let me interest you in it, in order that the revolution in human procedures may come more quickly—for come it must. The patient is inevitably

at least half of the problem, and the science of genetics can portray for us that main object of each medical procedure—the patient.

THEORY OF CANCER CAUSATION

An outline of this theory of cancer causation is as follows:

1. One unit recessive genetic factor for each type of malignancy (carcinoma, sarcoma, leukemic disease).
2. One unit recessive genetic factor determining each site for the type, that is, one factor for breast location, one for stomach, one for liver, and so on.
3. Possible non-genetic causative factors (environmental or intra-organic).
4. Metabolic relationships.
5. Longevity, or the ability to live into the age for high cancer probability.

Under this theory it is possible for different types and sites of malignancy to occur in the same individual, and this theory explains such multiple occurrences. This theory alone explains the recurrence of malignancy in the same or other locations, after a successful elimination of the first cancer has been accomplished by surgery or by irradiation, or by both. For the same genetic cause can result, in the same malignancy again, in the same patient.

Since the tendency to each type of malignancy is unit recessive, and since the tendency for each site of malignancy is unit recessive, it is possible to rule each one out by the presence in the mate of the dominant gene for that type or for that site of malignancy. For example, if there is breast cancer in one side of the family, mating should not be made with a family with breast cancer.

Behind every mouse in this laboratory there are heredity records, clinical records, autopsy and histological records for 100 or more generations of ancestry. Because of these records, and only by means of them, it is possible for me to predict, with a very small margin of error, of what every mouse in the laboratory will die, about when he will die, what other diseases he will have and the prognosis of recovery. Thus it is possible for me to prevent cancer, Bright's disease, heart disease, pneumonia and other conditions, etc., by selective breeding, or it is possible for me to breed in these diseases.

Like all the rest of the world, each one of you can have his part in the elimination of cancer by knowing and following, as far as is possible, the laws of heredity; by doing your share

toward the insistence for human records of heredity and of clinical and autopsy findings as a routine practice by your physician. Do not think that nothing can be done about it. Before Pasteur's work was accepted, and before Florence Nightingale's work was done, nobody thought that infective agents could be isolated, and infection controlled; and everybody scoffed at aseptic wounds and hospitals. Now these things are commonplace and have become routine procedures. The taking of scientific records of the patient, including heredity and autopsy records, must also become routine procedures.

We have no adequate human records. These would be difficult to get, but it could be done. We have succeeded in getting accurate criminal records, it is equally possible to get records for humanity not criminal but affected by diseases which cause great suffering. We keep adequate records of business and property transactions; it would be equally to our interests if we also kept records of human families, who are to run the business and own the property.

If specific types and sites of malignancy can be ruled out of mouse families, they can be ruled out of human families. In my work it has been possible, by selective breeding alone, to rule out breast carcinoma, that scourge of humanity, in the first generation in mice, and to keep it ruled out for a period of time which in terms of human life would be more than 3,000 years. We can make this possible for humanity by the simple method of taking adequate records now, and assembling them in central bureaus where they can be of service to the medical profession.

STUDY OF HUMAN RECORDS PROPOSED

There is, moreover, a matter in which these records will be of immediate value, and in which they can be of use at once. They will be of immeasurable and immediate diagnostic value. A study of human records, such as I am proposing, would show the attending specialist, first, the probable types of diseases to be expected in a family, due to heredity; second, the meaning of symptoms sometimes fatally hard to ascribe to their cause, but which have been presented before in the family; third, the probable reaction to types of treatment; and fourth, the probable prognosis. These things I can predict in my mice from knowledge of the family records.

This pre-knowledge of probable diseases, reactions and prognosis within a family would, I think, if it were universally at

the command of practitioners, revolutionize medicine, since we then would know not only something about the disease and its treatment of choice, but also we would know something about the patient.

As breeders of fine stock, you must be greatly interested in breeding cancer and other diseases out of your animals, instead of having to correct the errors in breeding, by the slaughter of large numbers of diseased animals in order to market your stock. I am certain this could be done by knowing and following the laws of heredity which are the basis of all disease and all freedom from disease. A trained geneticist should advise in all stock-breeding which seeks to eliminate disease.

But, first of all, you are a part, and your children are part of this vast experiment in human genetics everywhere going on, and of which we make no record. Meantime, we are swayed by a vast mass of superstition and wrong ideas, while we close our eyes to the almost limitless experiment of human nature, whose record, if we had it, would be of immeasurable value, both in preventing diseases, and in lengthening the span of vital productive human life. (Applause)

PRESIDENT SMITH: Gentlemen, if we are to judge the remainder of our program by the address to which we have just listened, we certainly must feel that we will be repaid for our efforts in being here today. Dr. Slye has presented to us a subject in which every person in the world is interested, and in behalf of this Association, Dr. Slye, I want to thank you and express to you our deep appreciation for the splendid address you have given us this morning. I am sure it is appreciated by everyone present. (Applause)

DR. C. U. DUCKWORTH: No doubt a great many people and members of our Association read the magazine, *Life*, and I recall very distinctly, not very many issues ago, seeing Dr. Slye's picture in it. I had no idea I would have the privilege of listening to her this morning, and I think just to sit still and thank Dr. Slye is not sufficient. I move we give her a rising, rousing vote of thanks for the splendid address she gave us this morning.

. . . The audience arose and applauded. . . .

DR. SLYE: Thank you. It has been very, very pleasant for me to be here today.

PRESIDENT SMITH: Now comes the headache of the morning session, I refer to the President's address. But before I proceed with that, Dr. Jacob, chairman of the Resolutions Committee, must leave this morning, and in his place I shall appoint Dr. D. M. Campbell as acting chairman of the Resolutions Committee.

. . . President Smith read his address. . . .

ADDRESS OF THE PRESIDENT

By R. W. SMITH, Concord, N. H.

State Veterinarian

Members of the United States Live Stock Sanitary Association, Guests, and Friends: We are meeting here today, in the opening session of the forty-first annual meeting of our organization, and if we are to judge the program that will be presented during the next three days by the opening address which we have just had the pleasure of hearing, I am sure we will all be repaid for the effort we have made to be here today.

It is needless for me to say that I have looked forward for a year to this day. I believe it was 16 years ago that I attended my first meeting of this Association, and with one exception I have been present and taken an active part in each and every meeting since 1921. Well do I remember the first meeting, and little did I realize then the importance of this organization and the part it plays in the program of disease control among our domestic animals. Those early meetings meant little to me. The chief topic of discussion seemed to be how *not* to coöperate on any one plan of disease control.

Tuberculosis eradication was only five years old at that time and, as I remember it, practically the entire program was devoted to this one subject, and there were as many opinions as there were people in attendance. Bovine tuberculosis eradication seemed impossible to many of us and yet when the week's conference was ended and the war clouds had cleared away, we went back to our homes with a program for disease eradication that was adopted and agreed upon by this Association, and a feeling that where there was union there was strength.

What is there about these sessions that bring three or four hundred men together each year from all parts of the United States, and from our good neighbor to the north, the Dominion of Canada? Is it just good fellowship alone, or is it the deep deliberation on disease eradication and control that causes us to go forward, ever forward in this great work in which we are engaged?

EARLY MEETINGS

In reading some of the early reports of this organization, I find that the chief aim in its beginning was to bring about uniformity of action in the various states in regard to tick fever. Soon, however, it began to broaden its scope and usefulness and

at the meeting held in Chicago, in 1899, bovine tuberculosis became the chief subject of discussion, and at its fourth meeting, held in Louisville, Kentucky, in 1900, hog cholera held special attention. Infectious abortion, animal parasites, and anthrax were discussed at the fifth meeting, held in Buffalo, in 1901. Scabies was added to the program in 1902 and, each year thereafter, new and important subjects dealing with disease control were added to the program and the information derived from the discussion of these diseases, their prevalence and distribution had a direct influence upon one of the purposes of our organization, namely, to suggest and guide the enactment of needed legislation and the promulgation of regulations toward uniformity and simplicity.

Have the objects of our organization changed much since these early years? I think not. If one studies the reports from year to year, he can readily see that the policy has been and is now to discuss and to formulate, insofar as possible, rules and regulations governing the control and eradication of contagious and infectious diseases of domestic animals, and the interstate movement of these animals, to the end that said rules and regulations will serve the greatest number of people with the least amount of inconvenience, and at the same time give the greatest safeguards and benefits to the majority.

During these 41 years, our organization has grown from a very sickly child to a robust, healthy parent, and I say parent without fear of contradiction. Organizations similar to ours are active in different localities all over the United States. For example, during the early days of tuberculosis eradication, the so-called northeastern states held several yearly conferences on the one subject, "Bovine Tuberculosis Eradication." It was the custom for one of the states in this group to act as host each year, arrange the program and conduct the meeting. The programs at these conferences were very similar to the programs of this organization. They differed in one way, that is, they dealt with one important subject only. These conferences were a great help to this group of states. They served as a clearing-house, so to speak, and aided in carrying on the work of tuberculosis eradication in an orderly and uniform manner. And so it is with our national organization. We meet here yearly, discussing policies that are of vital importance to all of us, and while there may be as many opinions expressed in the discussion, as there are members present, when the final vote is taken we are usually pretty much agreed.

It is interesting to review the policy of this Association since its organization down through the years, and to ascertain just how these policies have stood the test. I am not an authority on this subject, but I can find no record, neither can I remember of any action or recommendation of importance made by this Association that has later been repealed. In fact, the policies adopted have stood the test of years. Such a record cannot be overlooked, and too much praise cannot be given to those men who have been such important factors in the drafting of its policies and have given to this Association that something which has made it the outstanding organization of its kind in the world.

Soon after the adjournment of our meeting last year, I was reminded by our most efficient Secretary, Dr. Day, that it was my duty as President to appoint the several committees as listed in our report. I entered upon my new duties with enthusiasm and seriousness, and when I had completed the committee assignments I felt that I had placed the investigations and recommendations of animal disease control, as well as the future policies of this Association, in reliable hands, and after studying the program that will be presented here during the next three days I find no reason to change my mind. The reports of these several committees, with their recommendations, will be heard here on the floor as scheduled, and I hope that there will be a free and wholesome discussion of every report insofar as time will permit.

Thus far in this address, no particular disease has been discussed and perhaps it would be best if such discussions were left to the several committees. However, I feel I should mention certain diseases that in my opinion should receive the attention of this organization at this time.

BANG'S DISEASE

Bang's disease is receiving special attention at this time by all of the states and the Bureau of Animal Industry, United States Department of Agriculture, and there can be little doubt but that Bang's disease eradication will go forward rapidly until our domestic animals are as free from this disease as they are now free from tuberculosis. But, because of the fact that there is no federal regulation requiring that all bovine animals must be negative to the agglutination test for Bang's disease before they can be moved interstate, has caused several states to promulgate regulations of their own, with the result that there is very

little uniformity in these regulations. Because of this condition, the live stock breeder finds himself very much annoyed and many times embarrassed.

Officials in the North Atlantic States have already met on three different occasions during the past six months for the express purpose of discussing this problem, with the result that their committee has recommended rules and regulations for the eradication of Bang's disease and regulations governing the interstate movement of Bang's disease-tested cattle into these several states. A copy of these proposed regulations is already in the hands of the chairman of your Committee on Bang's disease. I have no doubt but that other groups of states have acted likewise, and I would recommend that this Association lend its influence and help insofar as possible to the end that the Bureau of Animal Industry promulgate regulations that will govern the interstate movement of all live stock insofar as Bang's disease and bovine tuberculosis are concerned.

RABIES

Last year, for the first time, I believe, we had a report on rabies. Rabies is more or less prevalent in many sections of the United States and, because of the seriousness of the disease when an outbreak does occur, it is my opinion that the United States Live Stock Sanitary Association could work for no better cause than for the complete control and eradication, if possible, of rabies in dogs.

TRICHINOSIS

About two weeks ago, I picked up an eastern daily newspaper and read of the serious sickness of 40 CCC boys located in Burlington, Vermont. Said illness was reported to have been caused by trichinae in pork. A few weeks prior to this, another item appeared in one of our eastern newspapers stating that 80 people were all more or less seriously ill with trichinosis. Their illness was traced to a banquet where black bear meat and pork made up the menu. Much publicity has been given this disease and the heavy infestation of trichinae in garbage-fed swine is apparent. If outbreaks of illness caused by trichinae in pork are occurring in different localities in the United States, and these outbreaks are given publicity as was given the two outbreaks to which I just referred, it seems to me that the hog-growers of our country are confronted with a serious problem, and the swine industry of the United States will suffer materially.

There are other diseases of the domestic animal that could well be discussed here and now, but time will not permit.

PUBLIC HEALTH

In October of this year, our efficient Secretary, Dr. Day, called my attention to Supplement No. 26 of the Public Health Program under Title VI of the Social Security Act, as set forth in House Resolution 7260, and a study of this Supplement reveals the fact that the United States Public Health Service has outlined what in their opinion constitutes a proper health unit for urban and rural communities of various sizes. This setup is quite complete, as it sets forth the number of staff physicians, nurses, bacteriologists, and others, for each size unit to be served, depending on the population. It also sets forth the fact that money will be furnished by the Health Service to establish health units if requested and their recommendations complied with. While they set forth in their regulations that the sanitary control of milk and food, including the methods of protection against such diseases as may be transmitted by milk and foods as one of their projects, yet I find no place for the veterinarian or the live stock sanitarian in their setup.

The question arises, "What constitutes a state or municipal veterinary service?" Have we the answer to such a question? Has there been a standard for a state or municipal veterinary service agreed upon? I know of no such standard, and it would seem that each state or municipality has its own standards for such service. Is not the time ripe for the establishment of a veterinary service outlined along the plan adopted by the United States Public Health Service to which I have referred, and if so, would it not be well for the United States Live Stock Sanitary Association at this time to appoint a committee to study the question? I would recommend that such a committee, if appointed, should be made up of at least four veterinarians and three live stock men. I would also suggest that our Executive Committee give this question serious thought and if they deem it advisable, make their recommendations to this Association later on in the week.

And while we are on the subject of veterinary service, it brings to my mind a thought expressed last year by my good friend and colleague, Dr. Wisnicky. In Dr. Wisnicky's address before this organization in 1936, he referred to the shortage of veterinarians to carry on animal disease control, milk and food inspection, and other veterinary work. Dr. Wisnicky shares his opinion with others who ought to know whereof they speak. Nevertheless, until the several states, together with the Bureau of Animal Industry, find it necessary to pay salaries for the

services of qualified, graduate veterinarians in excess of the daily wages now paid carpenters and plumbers, it would seem that there is little need for worry. I would recommend that, if this subject is of interest to this Association, a committee be appointed and instructed to make a study of the so-called shortage or surplus, as the case may be, of graduate veterinarians, and at the same time gather data as to the comparative salaries paid these veterinarians and the salaries paid other professional men engaged in similar or other branches of our government service.

I want to extend my deep appreciation to Dr. Day, our Secretary, for his most efficient work in handling the affairs of this organization during the past year. Dr. Day has proven himself to be almost an indispensable person, and I am sure that his services are appreciated by every member of this Association. I also wish to thank every man who has accepted a committee assignment during my term of office. To serve on a committee of the United States Live Stock Sanitary Association means work, and your willingness to serve has made this organization what it is today.

The price of continued freedom from the returning source of the ravishing bovine white plague which has been practically eradicated from the live stock of our country, as well as the pressing need to wage increasing warfare against other dangerous and economic live stock diseases, demands of us constant watchfulness and service. In the spirit of those who have fought and fallen, and who left to us the slogan, "Carry on," we must not fail.

*They spoke it bravely, grimly, in times of fear and doubt;
They spoke it when the tide of faith and hope seemed ebbing
out;*

*But they buckled on the armor in the troubled days now gone
And left to us their slogan, "Comrades, carry on."*

*"Carry on," when critics scoff and scorn you, "Carry on"
and doubt despair.*

*"Carry on," you'll win the battle though the burden's hard
to bear.*

*'Twas the slogan that they gave us as they fell beside the way
And for them and those who follow, we must "Carry on"
today.*

I want to assure you that I appreciate the honor and privilege of serving you as President during the year 1937, and when I turn over the gavel to my successor, on Friday afternoon, I shall

pledge to him and to this Association my continued support in every way possible. I thank you.

(Applause)

PRESIDENT SMITH: This concludes the morning session, and if it is agreeable with you, we shall recess now and reconvene at 1:30 this afternoon promptly, to continue the afternoon program.

. . . The meeting recessed at 11:45 a. m. . .

RECESS

WEDNESDAY AFTERNOON, DECEMBER 1, 1937

The second session convened at 1.30 p. m., President R. W. Smith presiding.

PRESIDENT SMITH: Gentlemen, we will proceed with the afternoon program.

I shall appoint on the Auditing Committee the following: Dr. C. C. Hisel, of Oklahoma; Dr. C. U. Duckworth, of California; Dr. F. A. Zimmer, of Ohio. In due time they will attend to their duties and report.

Will Rogers once said, "There is nothing so useless (except a close-up of Rogers) as a convention." But I don't believe Will ever attended one of our conventions, or he wouldn't have made that remark so characteristic of himself.

As you will note, this afternoon's program will be devoted mostly to Bang's disease, which is in the forefront at the present time. I know of no one who is in a better position to tell us the program of Bang's disease eradication over the United States than Dr. A. E. Wight, of the Bureau of Animal Industry, Washington, D. C. Without further introduction I shall present to you Dr. Wight. (Applause)

. . . Dr. Wight presented his paper. . . .

ACCOMPLISHMENTS OF FEDERAL-STATE BANG'S DISEASE PROJECT

By A. E. WIGHT, Washington, D. C.

*Chief, Tuberculosis Eradication Division, Bureau of Animal
Industry, U. S. Department of Agriculture*

The coöperative state and federal Bang's disease project conducted throughout the United States has made substantial progress during the past year. In some states the volume of work has been much greater than in others, as will be noted in the reports of the work furnished each month. During the past year, there was a considerable increase in the number of herds and cattle placed under supervision in this project. At the close of October, 1937, there were about 802,000 herds, containing approximately 8,200,000 cattle, under supervision in the Bang's disease control program. This is an increase of approximately

50 per cent in the number of herds and 27 per cent in the number of cattle as compared with October, 1936.

The records of the Bureau indicate that in three states more than 50 per cent of the breeding cattle over six months of age are under supervision. In eleven states from 25 to 50 per cent of the cattle are under supervision, while in 16 states the figures run from 10 to 25 per cent. In the remaining 18 states less than 10 per cent of the cattle are under supervision. The average for the United States is approximately 15.4 per cent.

During the fiscal year ended June 30, 1937, agglutination blood-tests were applied to approximately 8,000,000 cattle, of which about 398,000 (5.0 per cent) were found to be reactors, as compared to 7.0 per cent for the previous year. These figures include a considerable number of retests.

STATE AND FEDERAL FUNDS

Federal funds available for Bang's disease work, including operating expenses and indemnity, during the fiscal year beginning July 1, 1937, amount to approximately \$12,600,000. State appropriations for operating expenses and indemnity during the same period amount to about \$2,000,000, approximately 25 per cent of which is for operating expenses and the remainder for the payment of indemnities for reactors in states where such action is provided for by law.

PAYMENTS TO OWNERS FOR BANG'S DISEASE REACTORS

The maximum federal payment for reactors to the test for Bang's disease continues to be \$25 for grade cattle and \$50 for registered purebred cattle. In addition to these payments, the owner also receives the salvage. The owners of reactors slaughtered in Delaware, Florida, Maine, Maryland, New Hampshire, New York, Pennsylvania, Rhode Island, Virginia, Washington and Wisconsin now receive an additional payment from the State. In no instance, however, does the owner receive from all sources, including the salvage, a total payment greater than the appraised value of the animal.

During the past fiscal year, the average appraisal of cattle reacting to the test for Bang's disease was \$70.67, the average salvage was \$27.94, and the average federal payment \$26.45. In the states in which an additional payment was made, such state payment averaged \$9.07 per head. Approximately 9 per cent of the reactors obtained during that period were registered purebred cattle.

EXTENT OF BANG'S DISEASE

Bang's disease apparently exists to some extent in practically every locality where cattle are maintained, but the incidence of the disease is much greater in certain sections of the country than in others. As a result of the initial testing of herds under this project, it was found that an average of approximately 14 per cent of the cattle reacted to the test. In some counties where the work is being conducted on an area basis, very little infection is found, it often being not more than 2 or 3 per cent.

METHODS FOLLOWED IN CONDUCTING BANG'S DISEASE WORK

In several states arrangements have been made to conduct the work in a systematic manner over a given area, such as a county, and in such areas all the cattle are tested except those on which the test is not required. During the period from December 1, 1936, to November 30, 1937, this work was conducted under the provisions of the area plan in about 200 counties located in 17 states. In these counties initial agglutination blood-tests were applied to approximately 1,400,000 cattle, disclosing an infection of about 3.5 per cent. All cattle in the herds in which infection was reported have been retested one or more times, and the remaining reactors removed. A complete retest has been conducted on all the cattle in about 40 of these 200 counties, and reports indicate an infection of about 0.6 per cent.

In practically all the states most of the work is conducted under the individual herd plan, and in about 75 per cent of them the owners of herds under supervision receive a state certificate when their cattle have passed the specified number of tests and other requirements are met.

The blood samples obtained from cattle being tested in the Bang's disease program are, to a large extent, tested in official state laboratories either by the tube or plate method. In some states, however, thoroughly trained veterinarians are permitted to make tests by the plate method away from the central laboratory. From time to time, these veterinarians are required to submit duplicate samples to the state laboratory for comparison.

The Bureau of Animal Industry has been conducting tests of the antigen used in Bang's disease work, and has also submitted samples of dried serum to the different laboratories doing this work in order to obtain a report on the results of the testing of this material by the antigens used in the field laboratories. This work will continue throughout the coming year.

RETESTING OF SUSPECTS

Since July 1, 1937, records have been maintained by the various offices in charge of the Bang's disease work to indicate the results of retesting of suspects in herds of cattle containing reactors to the Bang's disease test. There is submitted below a table showing the results of this work up to November 1, 1937. A report on the retesting of suspects was given last year, but it did not cover infected herds only. A slightly higher percentage of the suspects were found to be reactors in this more recent report than in the one previously rendered.

REPORT ON RETESTING SUSPECTS FOR BANG'S DISEASE
FOUND IN HERDS CONTAINING REACTORS

July 1, 1937, to October 31, 1937

GROUP 1—Suspects to One Test

Number of suspects retested..... 19,003

Results:	Number	Percent
Negative to retest.....	10,057	52.9
Continued suspects	4,455	23.5
Positive to retest.....	4,491	23.6

GROUP 2—Suspects to Two Tests

Number of suspects retested..... 4,777

Results:		
Negative to retest.....	2,278	47.7
Continued suspects	1,509	31.6
Positive to retest.....	990	20.7

GROUP 3—Suspects to More than Two Tests

Number of suspects retested..... 5,089

Results:		
Negative to retest.....	2,281	44.8
Continued suspects	1,519	29.8
Positive to retest.....	1,289	25.4

FURTHER STUDIES OF VACCINATION

The experimental vaccination of cattle against Bang's disease has been conducted during the past year both at some of the experiment stations and in the field. The results thus far obtained indicate that it is much more advisable to limit the vaccination of cattle against Bang's disease to calves from five to seven months of age, and in the field experiments now being conducted this plan is followed. These calves are located in herds in which the incidence of Bang's disease in the adult cattle is at least 15 per cent. The vaccine is furnished by the Animal Disease Station of the U. S. Bureau of Animal Industry.

This project is now being conducted in about 285 herds, containing approximately 20,000 cattle, located in 25 different states. Thus far about 5,000 calves have been given the vaccine. It is

hoped that the information obtained from this field experiment will make it possible to determine just what can be expected from vaccination against Bang's disease.

A considerable amount of misleading information regarding vaccination against Bang's disease has been disseminated. In order to have the proper information available throughout the country, the Bureau of Animal Industry, last March, issued a press release on the subject. This was given a considerable amount of publicity, and indicated that although calfhood vaccination against Bang's disease gave encouraging results in controlled experiments, extensive trials under herd and farm conditions were desirable and necessary before it could be concluded that the method merited adoption on a large scale. This release further stated that "this procedure is still in the experimental stage, and live stock owners should hesitate to place faith in claims that promise more than scientific findings to date warrant."

PUBLICITY

During the past year, a considerable amount of publicity has been given the subject of controlling Bang's disease in cattle. The press and radio have been influential in this respect. Many meetings also have been held in different parts of the country to discuss the subject. Another map, showing the approximate percentage of cattle under supervision in the Bang's disease project as of November 1, 1937, is now available and will be given publicity.

In May of this year, a conference on Bang's disease was held at Springfield, Mass., attended by representatives of the North Atlantic States interested in the subject. This conference was given considerable publicity in that section of the country. A report of the proceedings have been prepared and many copies distributed to interested persons.

CONCLUSION

This work has now been conducted on a coöperative basis for a period of 3½ years, and it is apparent that the cattle-owners in many sections of the country are determined that the program shall proceed. The fullest coöperation on the part of all concerned, including, of course, the cattle-owner and his manager, is most essential. This disease cannot be controlled unless the owners have a good understanding of the many features pertaining to it and, also, the steps that must be taken if good results are to be expected.

Sufficient federal funds are available to continue the project until June 30, 1938, but the amount of work to be conducted by the federal government after that date will, of course, depend upon Congressional action. In the federal appropriation for the present fiscal year, provision is made that \$2,000,000 of the total may be used only in states which have made appropriations for indemnifying the owners of cattle that react to the test for Bang's disease. This indicates that more state coöperation will be necessary in the future. Many of the state legislatures do not convene until January, 1939. Therefore, it is hoped that coöperative requirements will not become generally effective before about the middle of that year.

It has been a great pleasure to appear on this program today before an audience so keenly interested in the subject, and, in closing, it is my wish to make some mention of Dr. W. E. Cotton, who retired from the Bureau on September 30, 1937. The many contributions he has made to veterinary science, with especial reference to Bang's disease, have been most valuable. His absence from these meetings will be very noticeable, but we are glad to know that he is now connected with the Alabama Polytechnic Institute, where he will continue some of his investigational work.

I thank you. (Applause)

PRESIDENT SMITH: Dr. Wight, you have brought to us your usual interesting and instructive paper on Bang's disease. I am sure that you will be glad to answer any questions that any member might wish to ask at this time. Are there any questions? If not, it can be discussed later, when we have the report of Dr. Fitch.

It is entirely fitting and proper, in a program of this kind, to learn something of how the layman, or the breeder, feels regarding the work which we are carrying on. The Committee has procured the services of Mr. Charles L. Hill, of Sarnia Farms, Rosedale, Wisconsin, who will discuss with us "What Does the Cattle Breeder Think About the Control of Bang's Disease?"

It gives me great pleasure to introduce Mr. Hill this afternoon. (Applause)

. . . Mr. Hill presented his paper. . . .

WHAT DOES THE CATTLE BREEDER THINK ABOUT THE CONTROL OF BANG'S DISEASE?

By CHARLES L. HILL, *Madison, Wis.*

Chairman, Department of Agriculture and Markets

My experience as a cattle-breeder may be said to date from one morning when I was about six or seven years old, when my father took me with him to the barn and pointed out a heifer calf born from a grade Shorthorn cow during the night. He

said: "This calf is yours. We are going to raise it, and the female progeny of this cow and her descendants are going to be yours until you have a herd of cattle of your own. I will raise the bull calves for steers, but the females will be yours."

We kept the cow, so that she calved ten different years. She had eleven calves, including one pair of twins, and they were all bulls. Of course, it was lucky for my father that it happened just as it did, because he would have been out of the cattle business himself long before the ten years was up, with the normal current of events.

At the end of the ten years, I sold the cow for beef for \$40 and borrowed \$100 to put with it. Fifty years ago Decoration Day, or, in other words, May 30, 1887, I purchased my first purebred Guernsey, which was a heifer calf. My father purchased three other Guernseys at the same time. Previous to that time, my father had a herd of very good grade milking Shorthorns. In the years before we bought the purebred cattle, as far as my memory goes back, he had one single instance of a cow having lost her calf. I remember that particular winter was one winter in which we weren't without milk on the farm, because we had a farrow cow. However, the cow lived many years after that and bred regularly.

EXPERIENCE WITH TUBERCULOSIS

At one other time I read a paper before this Association, telling my experience with tuberculosis. In that paper I reported that in the second lot of cattle that we bought in 1888, we brought tuberculosis into the herd, and told about our experience with that. I know I had not heard of tuberculosis in cattle until we had a calf die, and the local physician, who used to come to the barn every night after milk, said that if it was in a human being he would say that the calf died of tuberculosis. We performed an autopsy, and it showed that that was exactly what had killed it.

I doubt if, at the time we bought the purebred cattle, that we had ever heard of the disease, "contagious abortion." I remember that we had the first case in March, 1891. It happened the very day that we brought a herd of 22 more purebred cattle on the farm. If it had happened a few days afterwards, we would have said that we brought the infection in with this new lot.

THE FIRST ABORTION

This first animal to abort had come on the place as a calf, as I remember, at about six or eight months of age, so there

is nothing to give even the slightest intimation of where the infection may have come from.

It is perhaps enough to know that the experience commencing from that hour proved that we had contagious abortion. I feel sure, from what I remember about this case, that at the time the cow lost her calf, I had read in *Hoard's Dairyman* or somewhere else about there being such a disease as contagious abortion, so that we feared it from the very first. Within a year from that time, we had real infection in the herd, and we had as many as 14 cases in a single year. Never from that time until three years ago this fall, when we got the herd certified, did we have a herd entirely free of the disease. We never had a large number of cases in a year, and then an entire subsidence for a year or two, as some herds report, but we always had some cases every year, even though it may have been as low as one or two.

Just a few instances of things that happened in the herd to show the difference in the way the disease attacked individual animals. Included in the bunch of 22 cattle that we brought to the farm in March, 1891, was a heifer that had been bred recently. She dropped her first calf all right. Then she aborted four times in succession and milked for 1,430 days continuously. Because she was an extreme dairy type animal, she not only milked continuously, but the winter before she went dry she made a pound and a quarter of fat a day for quite a long while. At her next calving she calved all right, and for many years after that and made a very splendid official record.

There were many other animals, in fact my guess is that 50 per cent of those that aborted never bred again, and this is one of the enormous losses from this disease.

A HEAVY LOSS

It would be impossible to figure out what the loss has been in that purebred herd all these years, but I have frequently said that I was sure that it would be somewhere from \$50,000 to \$100,000, because I was not only breeding cattle on the farm, but I was importing large numbers of cattle from the island of Guernsey and some times I had to take some of those cattle to the farm. My experience with them would seem to prove that animals that had never been exposed to the disease when taken on to a farm where the disease was, were much more likely to abort than the animals that had possibly developed some immunity.

I constantly read all of the literature on the subject and apparently believed what the authorities said about the value of remedies, because with two single exceptions I never fell for the idea of trying anything in the line of a remedy. A word about these two instances would be of interest.

EXPERIENCE WITH METHYLENE-BLUE

Some of you will remember that somewhere about 1913 the Vermont Experiment Station announced that they believed that they had discovered the use of methylene-blue to be a real cure for the disease. When they made that announcement they prefaced it by saying that their experiment had not been carried on long enough to really be a scientific one, but they were so impressed with the results that they felt that they should early tell the public what their experience had been with the use of methylene-blue. They were perfectly fair in telling that it was only experience that they were reporting and not actual conclusions.

Because this information came from an experiment station, I, like many others, immediately proceeded to buy and use methylene-blue. The only result that ever came about on our farm from it was bluing everything from the farm buildings to all of the clothes that not only the men wore, but the clothes in the house, and even the sheets on the beds. The methylene-blue was put in the capsules on the second floor of a granary building. If you would go up there now and spit on that floor, you would have a spot as blue as methylene-blue could make it even at this late date.

I don't remember how long it was, but perhaps six months to a year from the time I started to use it, the Vermont people came out with the statement that they had found out that their early conclusions or guesses were entirely wrong and that eventually they had had another outbreak in a way that proved that the methylene-blue was of no use whatever.

Later there was a joke connected with my use of it that is worth mentioning as a diversion. I think I bought 100 pounds, as I remember it, at 75 cents a pound. During the World War the druggist from whom I purchased it, said to me one day: "Don't you wish you had that hundred pounds of methylene-blue? Do you know what it is worth now? It is worth \$14 a pound." I scratched my head a minute and said: "Goodbye, I'm on my way to the granary." I went there and found that I had a ten-pound package that was still unopened, and eight pounds in another package that had been opened. I sold the ten pounds

for \$14 a pound, and the eight pounds for \$10 a pound, so there was once in history when a person put some money in dope and got back more than he put into it, if he didn't figure anything about the time that he used up in administering it to the cows, and the false hopes that were destroyed when he found out that it was no good.

ANOTHER REMEDY FAILS

The other instance was a man who pestered the life out of me to get me to try a preparation which I knew was nothing but a mixture of bone meal and asafetida. It was supposed to be mixed with salt and put where the cattle could have no other salt, but have constant access to this mixture. Simply to get rid of him, I made him an offer that I would take it and pay a certain price providing that he would guarantee a cure as he said he could do. He took me up on it. He said that we would never have another case of abortion from the day we started to use the preparation. I told him that we would go him one better. We would feed the remedy for one year and if, after feeding it six months, we had no abortions between the six- and twelve-month period, that he would get his money. I continued to use it for nearly 18 months without any results. Then I knew that I had better discontinue it or there might be a time that I wouldn't have a case for six months and then he would be demanding the money. When I discontinued it, even though I had a written contract with him, he attempted to collect the pay for the entire amount at a high price per pound. He really tried to blackmail me by telling people that I was not good pay, and so forth.

People are still spending enormous amounts of money for remedies. Both from the knowledge that I have gathered from scientific authorities and by the experience that I have had as Commissioner of Agriculture, I know not only what an enormous amount of money has been spent and is being spent for remedies, but the worst of it is the false hopes that have been built up in farmers' minds, especially when perhaps, for a few months or even for a few years, they happened to be free of the disease and gave very strong testimonials for a particular remedy.

I am delighted that the federal government has recently carried out an experiment in connection with the Wisconsin College of Agriculture on two of these remedies, and the results have already been announced about one of them.

Speaking again of the false hopes inspired by the use of remedies, the very worst thing about Bang's disease in a herd

is that from time to time there will be spells when it will apparently have disappeared, only to break out anew. Each time a herd is free of the disease for a short time, the farmer makes new plans that usually, if not always, are eventually blasted.

MISLEADING ADVERTISING

One more word about remedies. The advertisements that are carried by the companies that are advertising vaccines for vaccination, that they are government-licensed or federal-licensed, makes the farmers think that the federal government is actually endorsing the use of these products.

Speaking of the losses suffered by the disease, of course, the loss to the purebred breeder is much greater than to the man who has only a grade herd. Add to this the fact that the purebred herds are more apt to be infected than the grade herds, because of the constant transfer of animals from one herd to another, makes the problem for the purebred breeder a very great one.

The showing of purebred cattle at fairs and expositions greatly added to the danger. I am glad to say that Wisconsin was one of the first states to demand that only Bang's disease-free cattle be allowed to show at our State Fair. The County Fair Association in Wisconsin is now demanding that the animals shown at county fairs in the state must also be Bang's disease-free. A large number of prominent fairs and expositions now permit only Bang's disease-free cattle to be shown.

When we put that regulation into effect in 1930, for the first year or two we had the same experience with exhibitors who were not on the square and with veterinarians who were not on the square in granting certificates of health, that you all know we had in the early days of attempting to enforce regulations requiring cattle to be tuberculin-tested that were to be shown at public expositions.

FIFTY THOUSAND HERDS TESTED

In am glad to report that we in Wisconsin have now tested 50,000 herds and about 900,000 cattle since the federal program started three years ago. The first certified herd in Wisconsin received its certificate in the spring of 1929. This was a herd of purebred Guernseys owned by Corium Farm at Fond du Lac, Wisconsin. The results reported from that large herd after it had been free of Bang's disease is worth particular mention as showing what can be done in a purebred herd.

The herd had been assembled from nearly every state in the Union and very high prices had been paid for some of the cattle, up to \$11,000 for a one-third interest in a bull, and \$17,700 for a cow, and many other animals at \$5,000 and upward. The losses had been terrible. After the herd became accredited, the manager gave out the following statement:

He said that when he took over the herd, as highly infected as it was, the records showed that the bulls were credited with about five services for every live calf produced. After the herd was cleaned up, that went down to about $1\frac{1}{4}$ services for a calf. When the herd was infected, they had less than a 50 per cent calf crop, and after the herd was free of the disease, they had a better than 90 per cent calf crop.

I mentioned above the importing of cattle that came from the island of Guernsey, where the disease has never been known. I had an excellent chance to study the results of those cattle being sold at public auctions or going into herds that were not negative, and I think I imported about 800 heifers carrying their first calves. As far as I know, only two of those lost their calves. But a very large percentage of them became infected and lost the next calf and from then on had the usual experience of infected cattle.

Recent hearings held in Wisconsin show that our farmers are becoming more and more to realize that at last we have a way to eradicate Bang's disease. There are many questions about it that can not yet be answered as, for instance, why infection may reappear in a herd, why the animals that are positive, and even whole herds that are positive carry their calves, and why animals that are negative sometimes lose their calves. Having tested the large number that we have in Wisconsin, we now get down to the law of averages. Our veterinarians who have had experience with both the tuberculin and Bang's disease test almost unanimously agree now that when we have carried on the program as long as we have carried on the tuberculosis eradication program, the Bang's test will prove to be just as reliable, and some even say more so than the tuberculin test ever was.

PUBLIC SALES SPREAD DISEASE

Public sales have been a great source of spreading the disease. More than a year ago, we commenced in Wisconsin to forbid the sale of any animals at public auction except negative animals, and recent regulations have been strengthened to apply

to all animals that are transferred from one herd to another so that they can be transferred only after having passed a negative Bang's disease test.

From my experience as Commissioner of Agriculture, I think we should not minimize the difficulties we encounter, as we know with our percentage of infection in tuberculosis originally in Wisconsin was around 3.5 per cent. From what we know now, our percentage of Bang's infection is four times as great. But we think that we have made marvelous progress to get more than 30 per cent of the cattle tested since the federal program started, to say nothing of the large numbers of herds that had been previously tested.

I think we will get further by not promising too much and not minimizing the difficulties, but still show that the experience of other farmers and dairymen prove that eventually we will be able to clean up the disease.

One of the most serious problems, as I see it from a producer's standpoint, is the almost certain attitude that is going to be taken by public health officials toward the sale of dairy products from Bang's disease-infected cows. Already we have 15 or 20 cities, if not more, in the state of Wisconsin, that require that all milk must be pasteurized to be sold, or that the milk must be pasteurized except from Bang's disease-free herds, or in other towns that all of the milk sold, whether pasteurized or not, must be from Bang's disease-free herds. I think I can see the day coming, and not far away, when there will be an ever-increasing number of cities that will make such requirements, and if I am right and the large cities make such requirements, then we will have to have a compulsory clean-up program.

Many of the states, as you know, are now making splendid progress with area testing, and I can see the same sort of a program ahead of us that we had with our tuberculosis program, in which we have now 46 states all modified accredited territory.

WISCONSIN STATE BRAND BUTTER

We are trying to look ahead and anticipate these requirements for dairy products coming from Bang's disease-free herds, because we have just recently set up a Wisconsin State Brand Butter, in which certain farm and plant requirements are made for the production of milk. Included in the requirements are that, at the very outset, 50 per cent of the milk must come from Bang's disease-free herds, and that two years from now all of the herds furnishing milk for this Wisconsin State Brand Butter must come from Bang's disease-free herds.

Perhaps we are moving too fast in the matter, but the committee of twelve of the dairy industry, who have set up the requirements for this Wisconsin State Brand Butter insisted that this requirement must go in and be made very strong. They were creamery men and not farmers. I mention that because I believe they are more closely estimating what future market requirements will be than the farmers are.

We must not be discouraged if in certain instances herds do not clean up as rapidly as we hoped they would. My own herd was an instance of this kind. Even after we had one or two clean tests, we would have one or two animals that were suspicious again. But now for three years we have been absolutely clean. This is quite in contrast with the work done in the herd of Commissioner Beck, who died last year, but was for several years on the Wisconsin Commission. He had a herd of 80 grade and purebred Guernseys in Waukesha County. On the first test, more than 50 per cent of them were reactors. He was not financially able to dispose of those animals at the time, and they kept the positive animals on one side of the barn and the negative ones on the other. They were pastured separately, but were in the same barn, and only one animal that was in the negative herd to start with ever went positive. In less than three years from that time, he had a certified herd.

Conditions in the clean-up of various herds will be all the way between the experience with Mr. Beck's herd and the experience with my own. But with my experience in my own herd and with the knowledge gained through eight years of contact as Commissioner of Agriculture, I am sure that we are going to be able to eradicate this disease. It will mean millions and millions of dollars every year to the dairy industry when this disease is eradicated. Experience with a clean herd as compared with an infected herd will be just a different sort of life.

VACCINATION

Those of you who are working as veterinarians and control officials in furthering this program, should have a very great sense of satisfaction in the way that you are being able to serve the live stock industry. There are still some veterinarians and some live stock control officials who do not believe in the program. Some of them, I am sorry to say, are telling the farmers that calfhood vaccination is the way out. I hope it may prove to be true, but from what I know of it, there is nothing that should make a farmer wait at all for a vaccination program

to be developed, because if it takes, as it will, several years to clean up a herd by that method, the loss in the meantime will have been very much greater than the loss taken by cleaning up a herd now by the elimination of reactors.

There is another angle to consider in a vaccination program. The program is yet in a experimental stage. After such a program is started, it will be at least two years before the first positive cows can be replaced by vaccinated two-year-old heifers. It is entirely possible that any immunity produced by the vaccination will have passed from the first animals vaccinated, and positive animals left in the herd will reinfect the vaccinated animals, and the herd would never be free of the disease.

The farmers naturally must look to you veterinarians and control officials for guidance. I am sure that they will have the same clear-headed foresight in leadership that has made it possible to eradicate tuberculosis. If we have that, as I am sure we will have, I hope to live to see the day when the loss from Bang's disease will have been reduced to a very low minimum or completely wiped out. (Applause)

PRESIDENT SMITH: It is very evident that all the so-called Yankees don't live in New England. (Laughter)

In all seriousness, Mr. Hill, I believe you have brought to this conference one of the most valuable papers that will be presented this week. It is valuable in more ways than one. Director Hill, I want to thank you. (Applause)

Back in 1921, when I first received my appointment at State Veterinarian of New Hampshire, Dr. E. A. Crossman, who was then and is now the Inspector-in-Charge of Tuberculosis Eradication in Massachusetts, New Hampshire and Rhode Island, suggested that we take a little trip to Montpelier, Vermont, and learn how Dr. A. J. DeFosset was carrying on the work in the state of Vermont.

I remember that trip. We arrived there in the late afternoon, and Dr. DeFosset was so enthusiastic that he drove us around over those hills until midnight, talking all the time about tuberculosis eradication work. The work which he did there was outstanding at that time. He was later transferred to the good State of Ohio, and from what I can gather he has been carrying on there in the same enthusiastic way.

We have him with us this afternoon. He will present to you "Problems Arising in the Federal-State Bang's Disease Project." Dr. DeFosset. (Applause)

DR. DEFOSSET: I believe I should say at the outset that the problems which I am going to present before this Association are those with which our men out in the field, in the front line trenches, are coping. We must keep in mind, when we think of those men, the fact that they are the men who are going back to that farm, probably where there is an extensively infected herd, where they must go perhaps every 30 days and, as our able speaker just before me said, probably 17 or 18 times, and explain some of these problems to the cattle-owners.

Here are some of the problems that these same men are presenting to us in our office, which we have to recognize and with which we must cope. It is entirely fitting, I believe, and I think the Association believed this when they put this subject on the program, that we get a little first-hand information on those problems.

. . . Dr. DeFosset presented his paper. . . .

PROBLEMS ARISING IN THE FEDERAL-STATE BANG'S DISEASE PROJECT

By A. J. DEFOSSET, Columbus, Ohio

U. S. Bureau of Animal Industry

When the elimination of cattle affected with Bang's disease was inaugurated as a project by the federal government in 1934, in coöperation with the states, it was well known in advance that many problems would be encountered. More than three years have now passed since this work was started. Some of the problems over which we had deliberated, during the last quarter-century, probably are still with us, and I feel certain, after reviewing the mass of reports I have on the subject in reply to a letter of inquiry which was directed to the official in charge in each state in which Bang's disease work is officially carried on, many new ones have arisen which plague not alone the owners of live stock but sanitary officials as well.

Many of these new problems relate directly, I believe, to conditions in the field, on the farm, and apply more definitely to sanitation, herd management, and administration of the program in general, than they do to laboratory technic and the various methods of diagnosis. However, in a few reports, the limitations of the agglutination blood-test are called to attention. A combination of all the factors mentioned as problems, if they manifested themselves to any degree in a single state, or a certain group of states, would not only challenge the ingenuity of science, but also test the patience of Job, as well.

In considering the matter of problems, let us approach our subject in a more or less philosophical manner. What is a problem and why our problem? A problem, as defined by Webster is "a question proposed for solution." Now there must, of necessity, be certain reasons or causes for birth of these problems and solutions must be found.

THE PURPOSE AND GOAL

We have in mind, in the program that was delegated to the live stock sanitary officials of this nation, a primary purpose

and a definite goal, and that apparently has become one not merely for the elimination of the Bang-diseased cow, but essentially one of *eradication of Bang's disease from the herd*, and to have such herd thereafter remain free from the infection. To do that we must have efficient means by which we may locate the affected animals in the herd and regulatory provisions that will enable us to remove them promptly from the premises. The degree of success in ridding the herd of the scourge is in ratio to the coöperation given by the owner and the punctuality with which certain sanitary measures are carried out, together with a sincere and a genuine interest on the part of the veterinarian in the field in each herd-owner's problem.

By no means should we overlook the importance, in the gigantic task before us, of the veterinarian out in the front-line trenches, so to speak. If the owner is indifferent or lacking in his understanding and the veterinarian fails to take an interest in his work, the project on that farm might, in the end, prove to be one of herd elimination from the farm instead of disease elimination from the herd. The veterinarian for this particular work should be carefully selected and then given the necessary training before he is assigned to work. He should be able to render the owner assistance from the knowledge he has acquired and give sound advice in herd management for the rebuilding of the disease-ridden and depleted herd, so that this owner may, as a farmer, as a dairyman, or as a breeder, recover from his loss without undue delay and be enabled to pursue again his occupation with profit and pleasure to himself and his family. This goal is not so difficult of attainment. Most of our men measure up unusually well for this service.

THE COÖPERATIVE AGREEMENT

The provisions of the coöperative agreement, to which the owner subscribes when placing his herd under supervision, and the rules and regulations are set up with a definite purpose in view and that is effectively to control and eventually to eradicate Bang's disease from the herd. It is our opinion that the subject of Bang's disease had been given much serious thought and deep study when the provisions designed to produce effective results were written into the agreement. It is recognized throughout this document that coöperation from the herd-owner is a prime requisite, and that common sanitary practice, which in this particular malady must include, also, proper herd management, is fundamental.

We know only too well from our past experiences, not alone with the eradication of Bang's disease but of tuberculosis as well, that rigid sanitary procedure must be followed; that the premises following the removal of the diseased animals still harbor the causative agent; that the introduction of cattle of questionable health status, also, those highly susceptible to disease, as replacements serve in many instances only as fuel to the fire.

Success of the enterprise will be dependent largely upon education and more education, and the importance of this is quite adequately expressed in the following quotation: "The secret of success is constancy to purpose."

It has become apparent that a very large majority of the herd-owners having the infection in their herds are in great need of correct information. Many have become sadly misinformed, and this applies also to a number of veterinarians. It is for this reason that we would stress education, and if we find ourselves lacking in this most important detail, our problems which already in the minds of some have pyramided until they have become monumental in stature, will continue to grow and become more numerous and perplexing.

I am mindful of the fact that I am speaking before a group consisting, in the main, of sanitary workers. As sanitarians we must not fail in our mission. If we feel at times that we have accomplished little more in certain regions of our state than the spreading of the gospel of truth and of fact, the effort has not all been in vain.

MANY OF THE PROBLEMS READILY YIELD TO SOLUTION

In making an analysis of the many problems that are encountered in Bang's disease elimination, I find hope in that the outstanding ones are not of such a nature that we can not expect eventually to find a solution. Truly, in some phases of the work connected with this project under discussion, it seems that there is a formidable array of them. However, many will be solved when we have better coöperation from the herd-owners and a better understanding on their part of the nature of the disease.

In a press release issued during January of this year, by the Bureau office in Washington, there were given some of the main factors why some herds continue to show Bang's disease infection even after several tests, and the removal of the reactors. The report was given following a survey made in nine states where considerable Bang's disease work had been done. An analysis of the reports from the officials supervising the work

gave 64 factors or reasons on this one problem alone. However, in 20 per cent of the factors, the addition of cattle from other herds was given as the chief cause of continued herd infection.

The next important factor, in order of frequency, was the virulence and high incidence of the initial infection and was listed as the cause in 15 per cent of the reports. The presence of suspects in the herd, cattle that either showed a suspicious test or had physical symptoms of Bang's disease, was given as the cause of further cases in about 12 per cent of the reports.

These three factors were considered as the most important causes of infection found in the herds after several official tests, and it was considered further by the Bureau that the factor that was of greatest importance as a cause of persistent infection, *i.e.*, the addition of cattle from other herds, was one which is not beyond the herd-owner's control. Mainly for reasons such as this one, is why there is stressed in this paper the need of more education. We had problems quite similar to these in the early period of our tuberculosis eradication campaign, and no remedy proved quite so effective as the inauguration of the area plan.

In order to avoid, insofar as possible, a repetition of the problems, I will not enumerate the other factors among the 64, given as reasons why infection persists in some herds, because some of these factors occur, also, in the list of problems which follows and are reported in a more recent survey over a larger area.

RECENT SURVEY OF PROBLEMS

This survey was made possible only through the kindly help I received from the field workers in our 48 states. Much material was forwarded to me, and it is almost needless to say that time will not permit of the use of all of it, nor of lengthy discussions of the problems. Therefore, only those considered by coworkers as of major importance are listed in the order of their frequency of occurrence, showing also the number of states in which they occur.

1. *Lack of coöperation and indifference to sanitation on part of owner* (23 states).
 - a. Indifference of owners toward maternity stalls.
 - b. Lack of thorough cleaning and disinfection (no supervision).
 - c. Impractical to segregate cows at calving time on the ranges.

- d.* Conditions of farms making it impossible to clean and disinfect thoroughly.
 - e.* Owners interested only when abortions occur.
 - f.* Difficult to convince owners that cow with calf by side is a reactor.
 - g.* Owners interested in eliminating cattle rather than Bang's disease.
 - h.* Fail to submit all cattle for test.
 - i.* Keep reactors too long on premises (30 days too long).
 - j.* Some owners refuse to eliminate reactors after test has been made.
 - k.* Herds pastured in community pastures.
 - l.* Difficult to protect tested herds from neighbors' untested herds.
- 2. *Additions or replacement cattle* (20 states).
 - a.* Difficult to secure tested cattle for additions.
 - b.* Regulations on additions unfitted for farm use.
 - c.* Unable to live up to agreement.
 - d.* Importation of dairy cattle from states where they do not require tagging and branding of reactors.
 - e.* Impossible to segregate additions.
- 3. *Suspects* (14 states).
 - a.* Too many suspects which later become positive.
 - b.* Rarely are segregated from negative animals.
 - c.* Too many animals classes as suspects in badly infected herds.
- 4. *Difficulties in getting owners to understand certain conditions* (12 states).
 - a.* Why some cows abort following negative tests.
 - b.* Why some cows react which have never aborted or given breeding trouble.
- 5. *Interference in project due to use of vaccine and abortion cures* (7 states).
- 6. *Difficulty of making retests at proper intervals* (6 states).
 - a.* Difficult to assemble cattle in range districts.
 - b.* Insufficient veterinarians to make tests, and particularly retests.

QUOTATIONS FROM A NUMBER OF THE REPORTS

In order that we may now have a more intimate contact with some of the outstanding problems as they affect the work in some states, kindly permit me to quote from some of the letters I receive on the subject.

First, I will quote from a report I received from a far eastern dairy state, depending largely upon importations from other states:

The present status of the Bang's disease work is about the same as the tuberculosis eradication work after the first three years of using the subcutaneous test. The herds consist almost entirely of purebred and certified dairies. Our most constant and discouraging trouble is persistent infection in a herd, and failure to clean up after repeated tests. Along with this condition, of course, we have all the attendant ills; that is, occasional animals which abort and do not react until after they have aborted, a large number of suspects, the necessity for frequent replacements which are usually highly susceptible, and other factors.

I will next quote from a southern state, relating some of their problems:

1. *Importation of dairy cattle for herd replacements:* Our state imports annually around 10,000 dairy cattle for replacements in dairy herds. Unfortunately due to various export states failing to require the tagging and branding and slaughter of Bang's disease reactors, we are receiving a percentage of reacting cattle from these states which, in some instances, have averaged as high as 10 per cent when tested immediately on arrival. I believe all states should require that all reacting cattle be properly tagged and branded and placed in quarantine until slaughtered.

2. *Unscrupulous practices on the part of dealers:* Cattle dealers are evidently taking advantage of the fact that various states do not require that Bang's disease reactors be marked for identification and are using unscrupulous practices in selling and shipping reactors to innocent buyers. Suggestion for a remedy to this practice would be for the various states to require all veterinarians to tag and brand all known reacting cattle.

The next quotation is from a mid-western state:

With regard to the problem of infection spreading in a herd, I presume we all realize that if maternity stalls could be used in all cases there would be decidedly less breaks in herds. Our experience here shows that where calf birth takes place in lots or pastures, or where abortion may occur in these places, this is followed frequently by a high percentage of the members of the herd showing reaction after having been negative for some time.

Another quotation is from a southwestern state:

In this state we have a number of people who go into the program with the idea of reducing their herds, or in plain words, "selling cattle to the Government." This is especially true in areas where drouth conditions are present or some other condition that is not conducive to live stock production. We have no way to know whether these people intend to continue with the test, and it is felt there should be some penalty. It has been suggested that 50 per cent of the indemnity be held in escrow until such time as the herd is accredited.

A quotation from a south-central state doing area work:

One of the most troublesome matters with which we have had to contend, in an attempt to prevent reinfection in tested territory, is the removal of cattle from auction markets back to farms.

It is almost an impossibility to satisfactorily control this situation but we are overcoming the difficulty fairly well by requiring a test on all bulls and females (feeders as well as dairy and breeding stock) not sold for slaughter to be bled and tested by the rapid method before leaving the yards. Reactors are branded and sold for slaughter. Suspects may be returned to the original owner's farm but may not be sold for movement to other farms. Unless the cattle are especially valuable, most owners prefer to sell the suspects direct for slaughter. A considerable number of reactors have been found by this plan which would otherwise have gone into tested territory. The weak spot in the plan is the unreliable dealer who removes cattle declared for slaughter and later sells them for other purposes.

We have encountered the usual difficulties in impressing on owners the importance of proper sanitary practices in eradicating the disease from infected premises. This is one of the most necessary things in connection with the whole project and probably the one most neglected. In our opinion each infected premise should be cleaned and disinfected under the personal supervision of a competent state or Bureau employé.

The old question of herd replacements has been probably one of our greatest difficulties. This, however, has gradually become less troublesome as the number of clean herds increases, affording a more ready supply. We find this is one of the distinct advantages of the area plan. It provides a greater supply of clean replacement stock.

Quotations from letters from western range states:

We are doing area testing, using each county as a unit. * * * From January 1 to October 30, out of the total number of cattle tested, we had 4.7 per cent reactors and 1.9 per cent were classified as suspects. We have found that the per cent of infection in range cattle is slightly higher than in dairy cattle. The greatest trouble we are having is with the suspects. Our retests show that, out of each 100 suspects on both second and third tests, 51 will pass, 31 will be still listed as suspects, and 18 will react.

In the range country very little control is had over the suspects during the summer. They are turned out on the open range, usually the first of April, and brought into the large fields or feedlots the first part of November. About 70 per cent of the cattle in this territory are the beef type and are run out on the open range in the summer, and 30 per cent are classed as dairy cattle.

Owners whose herds are under supervision have such poor facilities for isolating additions that very little effort is made by them to do so. Numerous herds that have been practically freed of disease have backfired after additions have been made. Efforts have been made to handle additions as a separate herd under a separate agreement until it and the original herd are both cleaned up, but it has been very difficult and discouraging so far.

Due to method of handling cattle here, turning out on open range and leaving them there at every opportunity, it is difficult to get all cattle gathered at proper intervals (30 to 60 days) to retest reactor herds. Therefore, much ground is lost by the reinfection or the carry-over of the infection by too long an interval between the tests. Also, some owners get discouraged at failure to get a negative test after about the second retest and lose interest. Also a problem is the inability to obtain the necessary qualified veterinarians to do the necessary work at the proper time.

Too many owners expect too much from the test itself. The herd is tested and the reactors are removed and that about sizes it up. No check or provision is made for the cow that calves or aborts between tests. They fail to advise the veterinarian of any breeding irregularities or outside contacts, etc., that may have occurred between tests.

I regret time will not permit quotations from all the letters. It will be noted from the foregoing that these are problems that present themselves in their respective geographical locations. Considerable time has been consumed in presenting the problems in these regions, and I have said nothing with regard to the problems in the central and north central regions of our country, so I must plead for your kind endurance with me a bit longer in my indulgence in one more quotation, for I am impelled now to quote part of a letter coming from a central and typical farming and dairying state. This one letter embracing, as it does, practically all the problems reported from the central states, will bring the quotations to a conclusion:

To me it seems that the most serious problems we have to deal with are:

1. Lingerin infection in the herd. This we believe in the great majority of cases to be due to an infected animal, either being one that (a) failed to react, (b) gave a suspicious reaction, or (c) was an addition to the herd. These additions to the herd are always accompanied by a great deal of danger in having new reactors show up on succeeding tests, even though they may come from a negative herd or from a herd that has passed two clean tests, although most of the additions we encounter do not come from such herds, but rather are animals that have been assembled by some speculator from various herds the status of which we do not know, and then given one test and sold, the various purchasers keeping them in isolation until they have passed a 60-day retest in compliance with the terms of the agreement. I believe that such animals should not be eligible for additions to herds unless they come from a herd where the entire herd has passed two negative tests. This, however, would be imposing a hardship on dairymen to which they would object, so I do not know how we will overcome that. The leaving of suspects in a herd, to my mind, is also fraught with great danger, even though only about 40 per cent of the suspects become reactors on subsequent tests.

The proper cleaning and disinfection of a premise, which is left to the owner to do without supervision, is, in my opinion, not very satisfactory and too often the disinfection, I fear, does not mean much of anything. I also believe that in many instances the veterinarian making the test, especially as a part-time veterinarian, does not take the time to instruct the owner properly regarding the possible source of danger for reinfection in a herd in order that he may guard against that.

2. Another great problem which bothers us is the fact that the blood-tests from different laboratories do not always show the same results. Too often we find herd-owners who, upon learning the results of the official blood-test, will employ their veterinarian to make a private test of their herd or, particularly, of those that react, and submit it to some other laboratory where the results

will not agree with those of the official test. While we know that there is a variation in the degree of reaction of an infected animal on tests taken thirty days or more apart, it does not seem that when tests are made only a few days apart that the results from the different laboratories should be so very different. Therefore, it looks as though there should be a greater uniformity in the antigen used by the various laboratories.

3. The next problem that is seriously confronting us at this time is that of vaccination, not only by the veterinary profession but also vaccination by laymen. The activities shown by some breeding associations, veterinarians, and biologic houses causes many a herd-owner to question the accuracy of the test and whether or not the test and slaughter method is the most satisfactory course to pursue in controlling the disease. Therefore, while the calfhood vaccination is still in the experimental stage, what course should we advise the average stockman to pursue, not only in preventing his loss and cleaning up the herd, or his premises, but in considering Bang's disease control as a county or state method?

4. The ever-present question: Why will some cows react which have never aborted or given any breeding trouble, and the reverse, why do some animals that abort never react at any time?

These are only a few of the more common problems we have, although, as you well know, there are several others, some of which we can satisfactorily explain to ourselves but which are hard to explain to the herd-owners.

SOME PERPLEXING PROBLEMS QUITE GENERAL

We now are able to visualize more clearly, I believe, some of the problems that perplex at times the men in the field. Several, of course, stand out more prominently than others and are as stated previously not beyond the control of the herd-owner, if we can obtain his whole-hearted coöperation. One, however, stands out in front over which he has no control, and the solution rests largely, we believe, with the technicians, the diagnosticians, and other scientists connected with laboratory or diagnostic and research work. The problem referred to is the suspects or those animals in both negative and positive herds having a titre that causes the individual to be suspicious of the disease. It is the opinion of a considerable number of the officials who supervise the work in the field that herd history be taken more fully into consideration when classifying animals in extensively infected herds as suspects, because of the altogether too frequent occurrence of suspects showing ascending titres which soon after their classification causes them to become, on retest, positive animals.

Problems such as are mentioned in this report have received discussion at regional meetings held at various places during the past year. One in connection with Bang's disease was held last May at Springfield, Massachusetts, and a very instructive report of the proceedings has been published. Quite recently,

in a meeting of the field and laboratory forces in the state of Minnesota, a number of problems confronting the workers in Bang's disease were given study and discussion. Here are some of the subjects discussed in the Minnesota meeting.

"The significance of laboratory and plate operators recording very suspicious and suspicious suspects in open and closed females, and the proper handling of same on farms between tests."

"The significance of calves from suspicious or reactor dams in close contact with negative dams."

"The significance in the minds of owners and veterinarians during the past 17 months in the reporting of 2,093 non-reactors aborting and 120 abortions among suspects—and whether such animals are a possible source of perpetuating the disease."

There is no question but what much good will result from a study of problems such as these in meetings of this kind.

COURAGEOUS EFFORT NECESSARY

Bang's disease during the past 40 years has had ample opportunity to entrench itself in the herds of our cattle. There were many factors favorable for its spread from one locality to another, and it had a clear and uninterrupted course largely because our live stock industry already had been struggling, for the past two decades, or more, to the limits of its resources in loosening the shackles fastened to it by tuberculosis, that the road continued wide open for its vulnerable attack.

The extent of herd infection in Bang's disease is very considerable in some regions, and this is the underlying cause and main source of many of the perplexing problems which confront our sanitary workers. Most of the discouraging results are reported from regions where the infection is extensive. But was not this true also in connection with our tuberculosis eradication program? Many of us here will admit that this is so. In agreeing to this, we then must also agree that the task before us is not wholly without hope of accomplishment.

Better methods of attack were constantly being developed as our tuberculosis eradication campaign progressed, and it would be distressing indeed if, with our extended experience, our vast wealth of knowledge and with the bolstering of the ranks with youth, our resourcefulness and inventive spirit had come to an end.

It was my privilege and pleasure to attend, very recently, at Albany, New York, a celebration for the achievement of a great event. New York had announced to her sister states her attainment to a place on the distinguished list of the modified accredited states. It did more. It heralded to the scientific and medical world the accomplishment of a task considered at one time well

nigh impossible. Nearly one million cattle in the state were condemned as tuberculous. How many are there in this audience who would have had the courage to say, 19 years ago, when this stupendous task was begun, that it could be accomplished with the means and methods then available?

We have here a noteworthy example of what can be achieved where there is vision, enthusiasm, courage, faith in one's self, together with a wholehearted display of team work and genuine coöperation among the workers.

It may be found as we proceed in our attack on this particular malady, that additional weapons may come into use and that some modification of our program may be necessary. However, my mission here is to bring before this conference "Problems Arising in the Federal-State Bang's Disease Project" and I have tried to hold to my subject.

If I have succeeded in a measure in doing this, I am indebted to my co-workers in all the states who have supplied the information, and it is with sincere appreciation that I acknowledge their help. (Applause)

PRESIDENT SMITH: Our next speaker is well known to those of us in the East. He was formerly with the Public Health Service in Massachusetts, and is now in Minnesota. To you, Massachusetts, what is your loss I am sure is Minnesota's gain.

It gives me great pleasure to present to you at this time Dr. Gaylord W. Anderson, Professor of Preventive Medicine and Public Health, of the University of Minnesota, Minneapolis, Minnesota. (Applause.)

DR. ANDERSON: I believe this is an historic occasion. For some time, I have been attending public health meetings in various parts of the country, and to the best of my knowledge this is the first time that a public health meeting has ever been held in a room where the ventilation came anywhere near complying with what we accept as the ordinary standard. So I congratulate you as being the first organization, to my knowledge, to achieve this end.

... Dr. Anderson then presented his paper. ...

UNDULANT FEVER AND ITS RELATION TO THE PUBLIC HEALTH

By GAYLORD W. ANDERSON, *Minneapolis, Minn.*

*Professor of Preventive Medicine and Public Health
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Ever since the striking researches of Evans showed the relationship between undulant fever and contagious abortion of cattle, public health officials have been giving increasing attention to the occurrence of *Brucella* infections in man. Were this a problem that involved man alone, the solution would be rela-

tively simple, for we are probably in possession of enough basic information so that we could theoretically prevent all such human infections. Unfortunately, however, the application of this theoretical knowledge is not simple nor can the problem be attacked solely from the standpoint of the prevention of a disease of the human race.

The infection of live stock with this organism was a serious problem to the live stock industry long before the close relationship between the disease in cattle and in man was recognized. Nor will the problem be solved if we devote our attention solely to the prevention of human infection and leave unsolved the basic problem of live stock infection which, in the last analysis, is the reservoir for infections of man. And so, speaking this afternoon as a former health officer, I should like to set up as a fundamental premise that any solution which, while protecting man, ignores the vast economic problem of Bang's disease in cattle, is but a makeshift remedy which must be ultimately supplanted by one which will serve to eliminate the infection from its live stock reservoir. Conversely the control program among cattle must be such that it does not entail an undue risk to the milk-consuming public.

IMPORTANCE HARD TO EVALUATE

The public health importance of undulant fever in man is hard to evaluate. There is no reason to believe that we are dealing with a new clinical entity, for it is probable that for decades and even centuries the disease has been confused with other febrile conditions. In the era before the development of exact bacteriological and serological tests, the physician was forced to rely on clinical judgment, which at its best is woefully inadequate in the diagnosis of a disease so protean in its manifestation as is undulant fever. Many of the cases were unquestionably confused with typhoid and with malaria and others fell in that gorgeous waste-basket of medical uncertainty, "pyrexia of unknown origin." So varied are the manifestations of the disease that the true incidence of the infection cannot be determined. In spite of our improved diagnostic procedures, many of the cases are never recognized, either because of lack of medical acumen or because of the patient's failure to seek medical aid for what to him is nothing more than a prolonged period of general ill health.

The practice of medicine would be very simple if all of the infectious diseases presented typical symptomatology and clinical findings. We recognize, however, all gradations of severity

in such diseases, each grade shading as gradually into the other grades as does one color of the physicist's spectrum shade into its neighboring hues. If we were to conceive of each infectious disease as representing a spectral distribution, at one end of this spectrum, in place of the physicist's ultra-violet radiations, we should find the fatal and severe infections, and at the opposite end, instead of the infra-red, we should have the cases which are so mild that they escape detection, in other words the sub-clinical infections.

MOST HUMAN INFECTIONS MILD

We recognize that undulant fever is a disease in which the majority of the infections occur at this lower end of the spectrum. As these infections are usually too mild to produce recognizable symptoms, we have no true measure of their true incidence. We do know, from surveys that have been made of selected groups, that a high infection rate does exist, and it seems likely that if we had more exact methods of measuring a former infection, we should find an even higher incidence.

This capacity of the *Brucella* organisms to infect without sickening is fortunate from the standpoint of the human being, though equally unfortunate from the point of view of the live stock industry. As human beings we probably derive from these mild, subclinical infections an immunity which protects us against subsequent massive infections which might produce serious disease. The disease in man is such that it is not spread to another person through usual human associations. Yet, in cattle, the spread of the disease is such that these infections which are at first unrecognized may serve to disseminate the infection throughout a herd and thus secondarily transmit the disease to the human. In approaching this problem we must therefore recognize that we are dealing with an insidious infection far more widespread than is usually recognized and one which, because of its lack of easily recognizable striking symptoms, is therefore doubly difficult to control.

It is logical to ask at this point why, if these human infections are usually so mild, should the health officer concern himself with this condition? If, indeed, these infections were invariably mild, one might justly maintain that the infection was of no public health significance even though we could hardly ignore conditions that without actually sickening might temporarily at least impair human efficiency. Unfortunately, however, the disease derives its public health importance from the very difference that exists between the words "usually" and "invariably."

Brucella infections in man are usually mild but not invariably so. The disease is severe in a sufficiently high proportion of the cases to justify serious efforts to protect man from its ravages. One has only to see such an infection, drawn out over a period of months with the attendant discomfort, disability and frequent complications, to recognize that as health officers we have a definite responsibility for its prevention, and that unless we assume this responsibility we are failing in our duties to the public for the protection of whose health we have been appointed.

ULTIMATE ERADICATION THE GOAL

The health officer's approach to this problem is quite naturally that of the ultimate eradication of the infection in its ultimate reservoir, just as we look forward to that happy day when our descendants may realize the ultimate eradication of typhoid and tuberculosis from their human reservoirs. We have not as yet achieved the latter goal, but our program has been set with that in mind. In the meantime, however, we can do much to protect the human being against typhoid and tuberculous infections through the interposition of a barrier across which the infection shall not pass from the reservoir of infection to the as yet uninfected person. Until such time as *Brucella* infection can be eradicated from live stock, we must as health officers devote our attention to the interposition of comparable barriers to protect man against undulant fever. This depends upon a thorough knowledge of the conditions underlying the spread of the disease to man.

The two methods through which *Brucella* organisms may find their way to a human host are so well substantiated that there should be little need to pause for their detailed discussion. We recognize the relatively high incidence of infection among veterinarians, slaughter-house employes, and others who come in physical contact with animals that may be carrying a recognized or unrecognized infection. These direct infections constitute an occupational hazard and have been recognized as such by a competent court of law. As long as the infection is so widespread among cattle and swine, there will remain an occupational hazard for those who are so exposed, a hazard difficult to reduce but none the less theoretically avoidable through the observance of suitable precautions on the part of those exposed to this risk. Such precautions, though not a guarantee of protection, will reduce the risk, however, and are therefore worth while. To what extent those who have less intimate contact with the tissues of infected animals may be exposed to the risk of infection I do

not know, though I suspect that under special circumstances this might occur. The ultimate eradication of these contact infections will depend, however, not upon the universal observance of such precautions as will reduce the risk of infection but rather upon the ultimate eradication of the disease among live stock.

MILK-BORNE DISEASES

The other method through which the disease may be transmitted to man, and the chief method of infection, from the point of view of the general public, is through the ingestion of raw milk from infected cattle. I am not unaware of the fact that the minute one touches upon the subject of milk-borne disease at a convention of dairymen or breeders, one is on as dangerous ground as would be a temperance speaker at a meeting of brewers. On the other hand, even the brewer recognizes the limitations of his product, and more recently the brewer has found it advantageous, from the point of view of both the quality of his beer and the sale of his wares, to pasteurize his product. So I feel that what I shall have to say on the subject of milk-borne undulant fever will be accorded the same sympathetic reception, for we know that the sanitary protection afforded to milk at the present time is not only a boon to the health of the public but is also one of the most potent selling factors in the dairy industry.

We do not need, at this time, to discuss the evidence to support the thesis that human beings may contract undulant fever through the drinking of raw milk from infected cattle. This evidence is too strong to admit of any doubt, all arguments on this point reminding one strongly of the heated discussions at the turn of the century as to whether or not oysters grown virtually at the mouth of a sewer outlet could convey typhoid to the person who ate them. Suffice it to say here that the evidence as to the possible spread of undulant fever through milk is actually stronger than is that to incriminate specifically contaminated oysters or water in the spread of typhoid. We can demonstrate the existence of *Brucella* infections in cows, can even find the organisms in the milk and can similarly culture the organisms from the blood-stream of those using this milk. This has been done so frequently that in tracing the average infection, we may place great reliance upon the epidemiological or circumstantial findings if supported by agglutination tests which, though less accurate than cultural findings, are none the less significant.

DANGER IN RAW MILK

That human disease due to the drinking of infected raw milk is not more frequent is probably due to the fact that, as mentioned earlier, the majority of the human infections are mild in character and immunize without causing disability. What may be the factors which cause the usual mildness of the disease need not concern us here. They are probably varied, including such factors as dilution of the infection in pooled samples of milk, variability in the period during which an infected cow may shed organisms in the milk, difference in pathogenicity of the several strains of *Brucella* and, finally, that indefinite and variable phenomenon that we label as human resistance. Whatever may be the explanation, we do recognize that milk-borne undulant fever infection, while usually mild, is often of a serious nature. Explosive and serious outbreaks have been described sufficiently frequently to indicate that there is a definite and not inconsiderable hazard associated with the sale of raw milk from a *Brucella*-infected herd.

Were there no way to avoid this hazard other than to refrain from drinking milk, we would feel that the advantages of the milk far outweighed the hazard of the infection. On the other hand, we know that through pasteurization we have at our disposal a method which both laboratory evidence and field experience show to be effective in the destruction of human pathogens and at the same time without appreciable deleterious effect upon the nutritive value of the milk. It is therefore the duty of the health officer to promote the pasteurization of milk and to insist upon the use of this procedure wherever such compulsion is practicable. His duty is just as clear as is that of the steamboat inspection service in determining the safeguards to human life that shall be required before a passenger ship shall be allowed to sail from port. Each draws upon experience in determining those factors which have in the past spelled disaster and each determines those requirements which must be met to avoid a repetition of this disaster. The one is just as negligent as the other if he ignores the teachings of experience and does not attempt to protect the public through insistence upon all reasonable precautions in the carrying on of the business in question.

PASTEURIZATION AN ARTIFICIAL BARRIER

Although the universal pasteurization of milk is an ideal goal toward which we may all strive, it will probably never be reached during our lifetime, owing to the large proportion of our popu-

lation who live under conditions where pasteurization of the fluid milk is not practicable. Nor do we as health officials wish to rely solely upon the artificial barrier of pasteurization in the prevention of undulant fever. It is but a partial solution and one which, while protecting the interests of part of the milk-consuming public, completely ignores the vast economic question of Bang's disease among cattle. The ideal solution is that which serves alike the interests of the live stock raiser and the public; this solution is the eradication of the disease among our live stock. Just as soon as an effective method is found which will satisfy the requirements of the industry without at the same time introducing a potential hazard to the milk-consuming public, just so soon will the health officers of the nation give to this program the same enthusiastic support that they gave to the program for the eradication of tuberculosis among cattle.

You are more competent than am I to pass judgment upon the effectiveness of the various methods that have been proposed for the elimination of Bang's disease among cattle. It would be presumptuous for a health officer to discuss such a topic before this group. I hope I may be pardoned for saying, however, that I have very serious doubts as to the ultimate effectiveness and economic practicability of a program of slaughter of reactors comparable to that used so effectively for the now virtual elimination of bovine tuberculosis. The possibility of control through use of vaccines would appear to me to be more promising. Those vaccines have, however, a public health aspect that I should like to mention briefly before closing this presentation of the health officer's point of view.

HUMAN RISK IN VACCINATION

In evaluating an antigen for human use we are accustomed to demand that it shall not only be reasonably effective, but that it neither cause undue reactions nor entail the danger of resultant infection with the disease in question. Thus we reject vaccines for infantile paralysis, because those which we know at present are either not effective or cannot be considered devoid of risk of imparting the infection to those to whom they are administered. As we do not consider animal life in the same terms as we do human life, we may modify these requirements when we judge the acceptability of a vaccine for animals, but if these animals or a product of them be so used that vaccine infection of the animal may secondarily cause infection of man, we are justified in demanding of animal vaccine safety from this risk.

I should be prepared to accept the doctrine that the currently available *Brucella* vaccines are capable of conferring a certain degree of protection upon those animals to which they are administered. I cannot, however, accept the doctrine that their use has been proven to be devoid of a potential risk of so infecting the cow that the use of the milk is at the same time hazardous. We are attempting to protect the cow through administration of an organism attenuated for the cow, but we have no reason to believe that this organism is at the same time attenuated for man. We know that with some of the vaccines, living organisms have been demonstrated in the milk. Furthermore, there is evidence both from the laboratory and the field to show that these organisms are still pathogenic for humans, though I do not believe we know anything as yet as to their relative pathogenicity as compared with non-attenuated organisms. There is even evidence to suggest that however much a vaccine of killed organisms might protect the animal experimentally, it does not protect that animal against the risk of being a shedder of organisms subsequently introduced into the system, even though these do not cause disease as manifested through abortions.

To what extent these risks may be avoided or minimized through limiting the use of these vaccines to calves in which the mammary glands are still undeveloped we do not know. The early reports would suggest great value to such vaccines from the point of view of protecting the animal. Theoretically they offer less potential hazard of subsequent passage of attenuated organisms in the milk, but it is still too early to pass even tentative judgment on this point which is of prime importance to the milk-consuming public. Speaking as a health officer, I sincerely hope that through these or similar vaccines we may realize effective control not simply of abortions among cattle but also control of *Brucella* infections and that use of such vaccines will be devoid of possible human risk. If that day is realized, we shall then truly say that we have a method of supreme value and one to which the health officer can give his enthusiastic support.

Until that end is achieved I should feel that we must rely on a combination of control measures. Granted that the present vaccines are effective in either preventing or reducing the incidence of abortions, we have then a method of great value to the live stock industry. Until we can say, however, that the use of this vaccine is devoid of possible risk to the milk-consuming public, or that the use of milk from vaccinated herds is less

hazardous than the use of milk from naturally infected animals, we must, out of justice to the public, insist on the pasteurization of the milk from these vaccinated herds. We shall always urge pasteurization wherever practicable because of the hazard of other diseases than undulant fever. As far as concerns this particular problem, however, it would appear to be a justifiable requirement for the sale of milk from vaccinated herds at the present time. Through a combination of vaccination and pasteurization we would appear to have a solution which, until such time as a satisfactory vaccine can be proven devoid of risk, would protect the interest of the public and at the same time serve the interests of the live stock and dairy industry. To such a program we can all give our enthusiastic support.

PUBLIC HEALTH OF PARAMOUNT IMPORTANCE

Some may question whether or not I am too cautious in insisting upon pasteurization of such milk. To such persons I would only reply that the protection of the health of the community transcends economic considerations, subject only to the limitation that the measures taken shall be reasonable and warranted by the seriousness of the problem. Such a principle has been universally recognized by the court. The health officer wishes to take no action which will in any way interfere with the economic welfare of an industry or of an individual, but when he must choose between economics and health he has no choice but the latter. The most effective measures, however, are those which best serve both interests, for there is at the present time no sales promotional force so great as that of health. If any one should doubt this, he has only to witness the sales of millions of dollars of worthless preparations through the appeal of promotion of personal or public health.

Such a program as I have suggested depends upon the close cooperation between health officials and the dairy industry. We have all witnessed in past years rifts between those groups, rifts that have served to delay progress. Fortunately these rifts have narrowed and except for a small but noisy minority in each group, there is general recognition that the two must work hand in hand for the benefit of both the public and the industry. We must recognize that we each have problems that should not be attacked without considering the viewpoint of both parties. If either party solves his immediate problem in such a way that it entails a risk to or an unnecessary burden upon the other, that is no real solution to the problem. The solution that we are both seeking is that which serves the interests of all. To this end I

would bespeak the forbearance and coöperation of both the live stock industry and all public health officials, for it is only by such forbearance and coöperation that we shall arrive at the goal which we seek. (Applause)

DISCUSSION

PRESIDENT SMITH: Dr. Anderson, I am sure I voice the sentiments of the members present in saying that they appreciate the efforts you have made in this presentation. Is there any question that any member would like to ask Dr. Anderson at this time?

DR. H. C. RINEHART: Did I understand you to say that the main source of infection was through milk? I believe that is what you stated, was it not? I should also like to know whether undulant fever is on the increase or decrease.

DR. ANDERSON: I would say, Dr. Rinehart, that if we leave out of consideration certain groups of the population, notably veterinarians, employes of slaughter-houses and the farming group, in the general population, I believe, the bulk of the infections are spread through milk. On the other hand, in a city such as Chicago, the bulk of infection is among persons in certain occupations more than in civil life.

As to whether it is increasing or decreasing, I do not believe anyone can answer that question. We are in possession of better methods of diagnosis than we used to be. Furthermore, the reported incidence of the disease depends, to a certain extent, upon the interest of the local medical profession in suspecting the disease and, therefore, obtaining the necessary blood samples on which the diagnosis is based.

You can almost say that, if a physician goes to a county medical society meeting and reports a case of undulant fever, within the next year you will find a higher incidence of reported infections in that county than in a county where no such infections have been reported. That does not mean that the secondary cases which are reported are false diagnoses. It means that the physicians are thinking of the diagnoses and are obtaining specimens to make the diagnoses. Whether or not the disease is actually increasing I have no idea; and I don't believe we could ever answer that question.

DR. RINEHART: I have gotten the opinion that undulant fever is on the increase. Maybe I am wrong, but I feel that perhaps contagious abortion in cattle is somewhat on the decrease, especially in our state. When we stop to figure the number of clean herds we have, and when we go back to think about war times, I feel that abortion is not so bad in Illinois today as it was in those days. I wonder why we have an increase in undulant fever if that is true.

DR. J. M. SUTTON: I enjoyed Dr. Anderson's paper very much indeed. He has brought out some very good points. I am just wondering if we are not giving the transmission of undulant fever in man too much consideration from the milk standpoint. I should like to ask Dr. Anderson if he has the percentages of the cases reported, showing whether they were of the porcine type or of the bovine type?

DR. ANDERSON: That will vary considerably in various parts of the country. I think there is a very general appreciation of the fact that the porcine strain is more infective for humans than is the bovine strain, and I would even hazard a guess (though it is nothing more than a guess) that perhaps some of the higher incidence in some of the midwestern states, as compared with the eastern states, is due to the fact that the bovine strain is more frequently encountered as compared to the porcine strain in the East, and that, being less

infective for humans, it is perhaps immunizing them rather than giving them a clinical attack of the disease.

The relative incidence, however, varies tremendously from one part of the country to another. There are a lot of data which could be assembled from certain places where cases have been carefully studied.

HON. CHARLES F. RIORDAN: I should like to ask Dr. Rinehart a question as to whether the disease is on the increase in the same places where Dr. Anderson has gathered his data.

In the state of Massachusetts, in 1934, we had 15 cases of undulant fever; in 1935 we had 42. At that time Dr. Anderson and Dr. Chadwick agreed that the increase was due rather to proper diagnosis than to spread of the trouble. In 1936, we had 55 cases, and up to and including November 15, 1937, which is within 15 days of the end of our fiscal year, we had only 34 cases.

The physicians have been on the lookout for it, so there is a large decrease. In Massachusetts it is not a health problem, and Dr. Chadwick and Dr. Anderson, I believe, agree with me on that point.

DR. W. H. HENDRICKS: I am very much interested in Dr. Anderson's paper, and I am particularly interested in the fact that public health officials are demanding pasteurization of milk supplied from vaccinated herds. A number of municipalities are adopting ordinances demanding pasteurization of milk. In our state we have that situation arising now. I am wondering if Dr. Anderson can tell us whether or not milk from vaccinated herds is responsible definitely for carrying undulant fever to humans, or if that assumption is made on the basis of what we would naturally expect from vaccine therapy.

DR. ANDERSON: I can answer that only by saying that organisms shown to be bacteriologically and chemically the same as those administered in the vaccines have been cultured from the milk, and have also been cultured from the blood-stream of patients using the milk. There is a recent case which came to my attention a few months ago, reported in French literature, on exactly that situation.

The organisms were a very attenuated strain, showing characteristic reactions grown on certain media, as contrasted with the ordinary virulent strain as encountered in the field. This organism, showing the same peculiar cultural characteristics, was isolated from milk and also from the blood-stream of a woman using the milk of this particular cow.

That has been done on other occasions, so I think we must acknowledge the fact that some of the vaccines that have been used, and used upon the lactating animal, can be passed over into the milk supply. Whether or not the risk of that is greater than the risk of organisms coming over from a certain percentage of infected animals and carriers in a non-vaccinated herd, I do not know, and I do not know that anyone has any figures to estimate the comparative risk.

If someone could show me that the risk of such transmission through the milk of vaccinated cows was less than the possibility of transmission through the unvaccinated cows, I should have to acknowledge that we have a safer procedure than in using the raw milk of the unvaccinated cows; but until we have some measure of the comparative risk, I think the only thing that we can say from the point of view as health officials is that we should insist, wherever possible, upon the pasteurization of the milk from these vaccinated herds.

As I pointed out, however, if we have no alternative other than not drinking milk, we can say only that the value of the milk is far greater than the possible risk of undulant fever; and under those conditions, in the areas where it is not possible to pasteurize the milk (and I recognize as you do that such areas exist in every part of the

United States, that no state is free of such areas), it is one of those hazards which we cannot be completely protected against at the present time; and although recognizing the hazard, I should still go out and urge the increased consumption of milk in those areas.

MR. A. J. GLOVER: I should like to ask the doctor two questions. It is well known that little or no milk is pasteurized on the farm. Do you find a higher percentage of undulant fever on the farms than in the cities where a considerable portion of the milk is pasteurized? Secondly, what is the difference in the percentage of undulant fever between adults on the farm and children on the farm?

DR. ANDERSON: I have in mind the figures for one state, namely, Massachusetts. We find a definitely higher incidence among the farmers as compared to the rest of the people in the state of Massachusetts. We have a relatively small farming population as compared to our large industrial population in the large cities, and cases of undulant fever in these large cities are almost unknown, a very definite proportion of the cases reported being among farmers. Whether or not, in those cases, the farmer was infected through drinking the milk from his own herd, or whether he was infected through contact with the herd, no one can ever answer in a case of that sort. I recall one farm where both the farmer and his son were infected.

You also raise the question as to the relative ages. These cases of human undulant fever are characteristically infections of older persons, or adults rather than of small children. That has been raised as an argument to indicate that it was not an infection spread through milk, because of the well-known fact that the infant and the small child are using more milk than the adult. That, I do not believe, is a valid argument, because we recognize in various other diseases that there are relative differences in susceptibility at different ages.

For example, we all recall, particularly in this part of the country, the sleeping sickness that went through Saint Louis some three years ago. They had some more of it this past summer. That is a disease which characteristically has been attacking the adults and not children. We see other differences in susceptibility at different ages. We have seen undulant fever proven by positive blood-culture in an infant of about 18 months of age. That is an exceptional case, however. I do not feel that that is anything other than one of the anomalous characteristics of the disease, and is not an indication to substantiate the lack of infection spread through milk.

MR. GLOVER: I wasn't asking the question just from that standpoint. I think if we had the data, they would indicate that milk occasionally does transmit undulant fever, and we must meet that condition. Here is what I had in mind when I asked you about the higher percentage among adults than children:

Some ten years or more ago, I heard milk very much condemned when data showed that undulant fever came from animals. Recognizing what the doctor has said in reference to children being not so susceptible to the disease as we older people probably are, it would seem that if milk were the chief source of undulant fever, the children would have a much higher percentage of undulant fever than adults.

In my study of the data, and talking with men who have made a study of it, I am led to believe that contact with animals is a far more dangerous source of contracting undulant fever than the drinking of milk, and I was glad to hear Dr. Anderson say that even with this danger he would still urge the consumption of milk.

Further, when we think how widely contagious abortion is distributed, how many millions of farmers have been consuming milk from infected herds, it is not a great source of danger in drinking raw milk from infected herds. Otherwise, our people throughout this region

would have been ill from this disease, for the past 50 years, and we would have recognized it to a greater extent than it has ever been recognized.

That doesn't mean that we should say there is no source of danger from drinking milk from an infected herd. As a dairy farmer, I do not believe that we can hope to sustain ourselves before the consumers of this nation when our herds are infected with any kind of disease; but I do think there are times when we over-emphasize the danger of contracting undulant fever by the drinking of milk, when after all, it is the contact with animals, and especially swine, that is the greatest source of spreading undulant fever.

PRESIDENT SMITH: This morning, in my address, if you will recall, I stated that the real work of this Association was done by the members of the several committees. They are, so to speak, the clearing-house for the program to which you are listening today, and which you will hear tomorrow and Friday. It means real work on the part of these various committees to prepare their reports.

Dr. C. P. Fitch, chairman of the Committee on Bang's Disease, comes to us from University Farm, Saint Paul, Minnesota, and he will read the Committee's report at this time. (Applause.)

DR. FITCH: Mr. President, and Members of the United States Live Stock Sanitary Association: I wish to take this occasion to express my appreciation to President Smith for his appointment of myself as Chairman of this very important committee. I also wish to take this occasion to express my appreciation to the other members of the Committee who have cooperated so efficiently during the past year.

The evolution of any matter tells something about its construction. For a good many years, it has been my privilege to be chairman of the Committee on Bang's Disease. I do not think that in any way the progress is better illustrated than in the deliberations of this committee.

Not so many years ago, meetings of this committee were fraught with anything but peace. They were prolonged far, far into the night, and began again in the morning; yet during the past two or three years, and especially this year, the unanimity of the opinions of the members of this committee has made the presentation and preparation of this report comparatively easy.

... Dr. Fitch then presented the report. ...

REPORT OF THE COMMITTEE ON BANG'S DISEASE

DR. C. P. FITCH, *Chairman, Saint Paul, Minn.*

Dr. Geo. E. Corwin, *Hartford, Conn.* **Dr. A. E. Wight,** *Washington, D. C.*
Dr. Cecil Elder, *Columbia, Mo.* **Dr. W. Wisnicky,** *Madison, Wis.*

The progress of Bang's disease control during the past year has been steady. Thirty-five states now require that breeding and dairy cattle either come from Bang's disease-free accredited herds or be negative to blood-test prior to entry, 17 states have partial or complete area testing programs, 33 states require that reactors be marked by branding or tagging, and ten states have an indemnity fund for animals condemned because of Bang's disease. This statement alone indicates the rapid progress in and the crystallization of sentiment for Bang's disease control.

Your Committee, in past years, has called your attention to the important phases of Bang's disease control. This year we desire to reemphasize certain phases which experience has shown to be extremely important.

RETESTS

In order that satisfactory results may be obtained in controlling Bang's disease, retests should be made at short intervals, especially of infected herds. When the first test shows infection, retests should be made preferably in 30 days, certainly not later than 90 days. In some herds where the infection is active, continued retests at 30-day intervals or even oftener, if possible, are desirable for satisfactory results. Such retests should be continued until the herd has passed at least three consecutive tests and at least 120 days intervening between the first and last negative test. After the spread of infection is under control, the interval of time between tests may be increased according to conditions in that particular herd. Large and unnecessary financial losses to owners of cattle are occasioned by lack of attention to this detail.

REPLACEMENTS

In the past, the importance of clean cattle for replacements has been stressed. Experience indicates that it is advisable to call your attention again to this factor. Clean cattle should not be added to a herd which is still infected with the disease. Clean cattle should not be placed on premises which have not been properly cleaned and disinfected after the removal of the reactors. The safest replacement animals in herds not infected are those secured from Bang's disease-free areas or from herds which are accredited as Bang's disease-free. If this type of animal is not obtainable, the cattle should be secured from herds which have passed two or more successive negative tests. Young, nonpregnant animals are usually the safest. Owners repeatedly state that they purchased their replacements from tested herds. This is usually true. However, herds from which positive animals have been eliminated have not been given proper consideration. Animals purchased at community or public sales and originating from unknown sources are one of the great hazards met with in the control of Bang's disease. Cattle-owners are not adequately informed in this connection. Wherever possible, the veterinary profession should give the stock-owner information that will aid him in properly handling his herd.

VACCINATION

Experimentation with Brucella vaccination has been continued by the federal Bureau of Animal Industry during the past year. Two hundred and eighty-five herds, containing approximately 19,000 cattle, are participating in this project. At least 15 per cent of each herd was infected at the time the experiment was taken up. In these herds there are about 5,000 calves that have been vaccinated between the ages of five and seven months. This experimental work has been conducted with a strain of Brucella organism having a reduced virulence. Other workers have been experimenting with an avirulent Brucella strain as an immunizing agent. All of these experiments have not been in progress sufficiently long for definite findings to be reported. The work is still in the experimental stage.

There is a problem in connection with Brucella vaccination which is compelling the attention of owners of live stock as well as live stock sanitarians, particularly in those states which are engaging actively in the control of Bang's disease. Brucella vaccine produced under government license is being shipped into various states and used without authorization of the live stock sanitary officials of those states. The

situation is such that the product is used in a large measure on a "bootleg" basis. In the use of the Brucella vaccine under such circumstances, the product is frequently injected into mature animals and in many cases into pregnant animals, with the result that these animals react positively to the agglutination test for Bang's disease. Many of such treated animals will retain their agglutination titres indefinitely.

Such a procedure comes in direct conflict with the coöperative federal-state Bang's disease program. Herd-owners who make a trial in the use of the so-called "bootleg" Brucella vaccine may and do become discouraged and then seek relief through signing a contract under the federal-state coöperative project. This brings about a situation in which a vaccine produced under government license finds its way to be used secretly by herd-owners. As a result, Bang-reacting animals are developed in their herds through its use. Such herd-owners later sign the federal-state coöperative contract, test their animals under the area plan and may receive indemnity from the federal and state governments for animals that were made reactors through the unauthorized use of Brucella vaccine. This procedure is not consistent with an efficient Bang's disease control program. Your Committee recommends that those producing Brucella vaccine under a government license should be required to report to the live stock sanitary officials of the various states into which they send Brucella vaccine, indicating to whom the vaccine was shipped, the amount shipped, and the date of shipment.

According to information available, "bootleg" Brucella vaccine is administered in a manner that is not in accord with the practices employed in the investigational procedures. It is evident that the misuse of the vaccine at this stage of investigational progress will tend to bring premature bad repute to it. If the ultimate investigational findings should indicate that the vaccine has merit, when employed according to a well-defined procedure, it will take some time to overcome the adverse sentiment engendered by the bad results secured when the product is improperly used.

PUBLIC HEALTH ANGLE

The problem pertaining to the use of Brucella vaccines must be given consideration from the standpoint of its relationship to the public health. The increasing tendency of cities, municipalities and villages to provide requirements that cattle producing their milk supply must be negative to the agglutination test for Bang's disease should be given consideration. More definite knowledge is necessary on the effect which the Brucella organism, even of reduced virulence, may have when it gains entry into the human body.

Public sentiment is being molded rapidly in favor of complete eradication of Bang's disease from cattle, and this movement should be thoroughly and completely sponsored and supported by our organization. The states should be encouraged to enact suitable legislation, and appropriate funds should be provided to coöperate further with the United States Bureau of Animal Industry in a nation-wide program of eradication. The more rapidly such a program is carried out, within reason, the more effectively it will be done.

AREA PLAN

The eradication of Bang's disease by the area method has been expanded and improved during the past year. Several states have adopted the method and the work is actually in progress in 195 counties in 17 states. At this time, sufficient progress has been made to prove conclusively that Bang's disease can be eradicated from the cattle in this country by this method. In some states extensive testing under the

area plan has shown a surprisingly low incidence of Bang's disease infection as well as a very rapid reduction in the amount of infection in areas where programs have been carried out in detail. Any program to eradicate Bang's disease by the area method in any state should be carefully studied and adapted to the cattle-breeding industry of that area. When the work is actually started, it should be supported and protected by effectively carrying out all phases of Bang's disease control and eradication. Premature or incomplete programs of this nature will result in irreparable damage to the cattle-breeding industry in any area as well as to the future of Bang's disease eradication. All programs for Bang's disease eradication which are undertaken in this country should be shaped to conform as nearly as possible to the area regulations for Bang's disease which were adopted at the 40th annual meeting of this Association.

COÖPERATION

We desire to commend most heartily the regulatory officials of the northeastern states who have, through coöperative means, drawn up suggestions for the control of Bang's disease and have adopted rules and regulations which will be used as the basis for interstate and intrastate traffic of cattle as related to Bang's disease in their section. Many years ago, your Committee recommended that states draw up rules and regulations to protect Bang's disease-free animals and herds. All but three states have such regulations at this time. We now note groups of states meeting and discussing mutual problems, as a result of which, plans are laid for more uniform rules and regulations. This is a most encouraging sign. Progress is being made in this direction and the time is approaching when federal regulations will simplify still further the interstate movement of cattle. We recommend that other groups of states having common problems join in discussing and adopting uniform rules and regulations.

ANTIGENS

During the past year the federal Bureau of Animal Industry has been conducting work in connection with the testing of antigens used in the Bang's disease program. Other laboratories have been engaged in similar activities. A report, soon to be published, shows that there has been, during the past two years, constant improvement in plate antigens used for testing for Bang's disease. The results show further that a great deal more must be accomplished before plate antigens are uniform. The federal Bureau of Animal Industry has suggested changes in manufacture which were deemed necessary. The state live stock sanitary officials should look carefully into the source, methods of manufacture and antigenic properties of plate antigens used in Bang's disease control work.

Progress has been achieved during the past. Let us look forward to another year of effort which will bring us closer to the goal of Bang's disease control and ultimate eradication. (Applause)

DR. FITCH (continuing): Mr. President, I move that this Report be referred to the Executive Committee.

DR. GEORGE E. CORWIN: I second the motion.

... The motion was voted upon and carried unanimously. ...

DR. FITCH: For your consideration and reference to the Executive Committee I should like to present the following resolution:

RESOLUTION

WHEREAS, The service of the federal Bureau of Animal Industry has been extended to practically all of the states in the Union in

coöperation with the live stock sanitary authorities in the control and elimination of cattle affected with Bang's disease, and practically all the states have enacted laws or adopted rules and regulations requiring that all imported cattle must have passed satisfactory complete negative tests for Bang's disease, and a number of these states are requiring that animals pass complete negative tests in dilutions of 1:25 and 1:50, and

WHEREAS, Results are reported of such tests made in the various laboratories and also by the plate agglutination test made by approved veterinarians with antigens that have not been standardized and vary materially in their sensitiveness; therefore, be it

RESOLVED, That this Association recommend to the United States Secretary of Agriculture that he adopt a ruling providing that all Bang's disease antigens used for coöperative and official Bang's disease testing shall be prepared and standardized in accordance with the method and standard designated by the United States Bureau of Animal Industry.

Mr. Chairman, I move the adoption of this resolution and its reference to the Executive Committee.

. . . The motion was severally seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: This report is now open for discussion.

DR. DUCKWORTH: First of all, I wish to compliment the Committee on Bang's Disease for the excellent report. There are a couple of things in the report that were stressed (that Dr. DeFosset also stressed) and one was the absolute necessity of coöperation on the part of the owner. Dr. Fitch also spoke of the necessity of having a complete program if we are going to do the job.

At this session, we are talking about asking for a standardization of antigen, which indicates that we are far from working on a uniform basis. The control of antigen so that animals will not move interstate unless they are tested with a recognized standard antigen is being asked in the resolution just passed, indicating a need for more standardization, and that we are (or have been, so to speak) shooting in the dark. Perhaps we couldn't expect to be shooting in any other direction, because this program has come along very, very rapidly.

Back in 1917, when tuberculosis work began, it didn't progress very rapidly; but in 1934, it was given a great impetus by the appropriation of a lot of money when there was talk of cow reduction, and logically the right cow to take out was the diseased cow, and she was taken out through tuberculosis eradication; and now we are moving into Bang's disease.

I wonder if we would move rapidly without more uniformity than we have now, if we will not find ourselves, maybe, thinking that we traveled a little bit too hastily. I wonder if we can get uniformity by meeting here once a year, or if it wouldn't be necessary for this Association to have a committee to travel throughout the country to help us to bring about that uniformity. It isn't going to be an easy thing, gentlemen, for you to get your legislators to appropriate a lot of money to slaughter animals infected with Bang's disease, when you have just got through with the job of tuberculosis (and we are not through with that yet); but when other people are standing alongside you and are saying, "How come you pulled out my peach trees and didn't pay me a nickel for them?" you will have to answer them.

We had that in our own legislature last time, and had difficulty getting money to continue a tuberculosis eradication program when it was pointed out that it took longer for a peach tree to mature than it did a dairy cow, and the owner was paid for the tree, and that barren land would not compensate them as greatly as it would to replace a cow and start production immediately.

I don't think it is going to be an easy job. Then, there is another question that was put up to me recently. I give it to you for what it is worth. I walked out under the door with my hat on when it was sprung on me.

At a meeting of one of our farm organizations, one of the men came up to me and said, "I wish you would do some tuberculosis testing in such-and-such a county. We are being crowded by the market and will have to have the cattle tested."

I told him I couldn't get anybody there in less than 90 days.

"Why not?" he asked.

"Were short of men," I replied.

"Well, get some more men."

"Yes, but the men aren't available."

About that time, one of the gentlemen who carries a lot of weight in the legislature strolled up and listened to our conversation. I explained to him that we were after veterinarians to do the work, that we had sufficient money to put more men on, but that we couldn't get the men.

"Don't they graduate veterinarians any more?" he asked.

"Yes," I replied, "but they are apparently graduating an insufficient number, because I can't get any men."

Then I told him that a year before I had advocated before the State Board of Agriculture, at which the Dean of the College of Agriculture was present, the possibility of putting a veterinary college in the University of California. The Dean said then that the demand would have to come from the industry.

"How long will it take?" he asked.

"About five years," I replied.

And the influential gentleman said, "I don't see why the hell it takes a man five years to learn how to kill animals. If an animal gets glanders, you slaughter it; foot-and-mouth disease, you slaughter it; tuberculosis, you slaughter it. You talk about slaughtering every animal with Bang's disease, and I understand that in some places in the country they are slaughtering cows because of mastitis. I read in the paper about a great national movement on some so-called social diseases. It's a damn good thing the veterinarians aren't handling that!" (Laughter.)

I could have walked out under the door then, but he took another shot at me. He said, "You are going to take my cows and send them to market, but you are going to leave my hogs there. Can you tell me that the strains of bugs," as he put it, "that affects hogs is not going to be pathogenic for cattle when they have been raised susceptible to the disease?"

I told him that I couldn't answer him, and that I did not believe anybody else could, either.

"It seems to me, then," he said, "that you fellows are acting a little bit faster than your knowledge indicates."

Then he said, "I think it would be a good thing if you men as veterinarians would eradicate diseases a little more scientifically and a little less heroically."

PRESIDENT SMITH: California, you're here. Does anyone else wish to discuss this subject?

DR. WALTER WISNICKY: When I heard that oration, I went through the mental process and through the realization that the state of Wisconsin, as far as progressing in Bang's disease control is concerned, was receiving a very pronounced "tug on the tail." I would take it more seriously if I didn't call to mind some remarks that the Hon. Joe Mercer, from the state of Kansas made a few years ago when the previous speaker, instead of extolling the beautiful sunshine of California, got up and said, "It's hotter 'n hell in California."

I remember that Joe Mercer said, "Now, young fellow, you'd better be careful how you talk, because when you get to California you may hear something else."

This program of Bang's disease control has established itself pretty much on its own merits. The fact that herd-owners are going into this program in a more rapid way than they did in the tuberculin-testing program, I think, is brought about by the fact that the program is demonstrating its effectiveness to herd-owners. There are certain evidences of accomplishment in the control program that they recognize. They know it will be of economic benefit to them to avail themselves of the program, because they perhaps have already too long tried to operate satisfactorily with an infected herd; and that is the explanation, I believe, for this widespread and intensive interest in the control of Bang's disease. These herd-owners are using factual information which becomes evident to them, as the program progresses, that this program is beneficial to them.

I closing, perhaps I should tell you a story, which may exemplify the situation here, about two men who planned a hunting trip. The one was a youngster who had had no experience in hunting. (I don't mean to imply that California has had no experience in Bang's disease control, because they have had just a little). The other was an experienced hunter who had engaged in that fine sport for a good many years. Instead of going on his trip in a hurry-scurry fashion, the older hunter prepared himself for the eventualities that might be encountered. Among other things he carried a compass.

As the two hunters got to the end of their trip and were ready to turn back, the youngster contended that they should go in the opposite direction. The old-timer said, "Young man, the compass says we should go in this direction."

So the youngster could do nothing but follow the old-timer, and as they got nearer and nearer to their journey's end, the young fellow continued to protest. Finally the old-timer turned and said, "Young fellow, don't you see the sun? The sun verifies my compass."

And the young man replied, "Yes, but the sun, too, is in the wrong direction." (Laughter and applause)

DR. DUCKWORTH: I'll acknowledge that Walter is a hunter and that he has had lots of experience with Bang's disease, whereas I have had very, very little. But when I look back at ancient history, I find that Aristotle's theory was that a heavy body fell faster than a light body, and that theory prevailed for 2,000 years before Galileo disproved it. (Laughter)

PRESIDENT SMITH: We must hurry on.

This morning I spoke of the fact that last year was the first year that we had a discussion on rabies in dogs. We had a very fine report then, and Dr. Rinehart, chairman of the Committee on Rabies, will present a report at this time. (Applause)

DR. RINEHART: Your Committee is giving you a report on one of the most serious diseases that we have. There is no disease known that is in a class with rabies, due to the fact that it affects all live stock as well as human beings.

. . . Dr. Rinehart then read the report. . . .

REPORT OF THE COMMITTEE ON RABIES

DR. HERMAN C. RINEHART, *Chairman*, Springfield, Ill.

Dr. Frank Breed, Lincoln, Neb.

Dr. M. F. Barnes, Harrisburg, Pa.

Rabies is one of the oldest recognized contagious diseases of man and animals. Rabies was reported as early as 1300 B. C.

There is no excuse for the continued existence of a disease that causes the anxiety, suffering and expense that rabies does, when meas-

ures for its control and even its complete eradication are known and are comparatively easy to carry out. Thousands of dollars worth of live stock and many valuable dogs are destroyed each year as the result of the animals being bitten by rabid dogs. The number of persons required to take the Pasteur treatment because of having been bitten by rabid dogs or otherwise exposed to the disease is each year becoming greater.

All warm-blooded animals are susceptible to rabies, but dogs are the most common disseminators of the disease. The ultimate suppression and eradication of rabies in both man and animals is therefore dependent upon the adoption of measures that will effectively check the disease in dogs. This requires the active and intelligent coöperation of dog-owners, public health and live stock sanitary officials, police officers, veterinarians, physicians and the general public.

That rabies can be completely eradicated from a country has, however, been proven in England, Ireland, Denmark, Norway, Sweden, Holland, Australia and Hawaii. England's work towards the eradication of the disease through compulsory muzzling of all dogs and a six-month quarantine of all imported dogs has become almost a classic in medical history.

To control and eradicate rabies successfully, your Committee feels that the veterinary profession as well as the medical profession as a whole must come to a common understanding as to the best method of control and eradication. From the reports received from the states of the United States, they all depend on quarantine measures and the destruction of stray, homeless dogs.

Two states recommend vaccination and do not mention quarantine, but the consensus of the chief veterinarians of all states is strict quarantine, vaccination and the destruction of stray, homeless dogs. Due to the fact that the dog is a common carrier, we must direct our campaign towards the dog.

In the following states rabies is quite prevalent:

Alabama	Florida	Michigan	Oklahoma
Arizona	Illinois	Mississippi	Pennsylvania
Arkansas	Indiana	Missouri	Texas
California	Kentucky	North Carolina	West Virginia
Delaware	Massachusetts	Ohio	

In the following states there have been a few isolated cases:

Georgia	Maine	New Hampshire	Tennessee
Idaho	Maryland	New York	Washington
Iowa	Nebraska	Rhode Island	Wisconsin
Kansas			

The following states are free of rabies:

Colorado	Nevada	South Dakota	Wyoming
Connecticut	North Dakota	Utah	Vermont
Montana			

We have no report from the following states:

Louisiana	New Mexico	Virginia
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We have no statements from the following states:

Minnesota	New Jersey	Oregon	South Carolina
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Records show Illinois has more rabies than any other state. Therefore, we are giving you a report of the rabies situation in Illinois:

Downstate:

Heads examined	758
Heads positive	320
Treatments issued	4,475
Human deaths	3

Chicago:

Heads examined	770
Heads positive	261
Total heads examined in the state.....	1,528
Total heads positive	581

Out of 102 counties of the State, we have reports from 98 counties, indicating \$221,475.67 as the total amount of claims presented to the County Boards for the year of 1936, and 181,277 as the number of dogs assessed. The percentage of claims paid was 77.48.

We have approximately 8,000,000 people in Illinois. We are making a conservative estimate of one dog to each 8 persons, which would mean we have approximately 1,000,000 dogs in the state of Illinois.

In my discussion of the report to this Association in 1936, I stated we had lost eleven persons affected with rabies. So far in 1937, we have had three deaths in the human family. Mrs. Vera Godker, of Cook County, who was 67 years of age, was bitten on the left thumb and right hand, and contracted rabies in 40 days. Treatment was started five days after exposure. She was given 21 treatments. There was some criticism made in regard to this lady's death. I will quote a portion of a letter written by Dr. Frank Jirka, Director of Public Health of Illinois at the time:

"... In spite of the institution of prompt and adequate vaccination against rabies, between one-half and one per cent of persons bitten by rabid animals contract rabies. This means that while vaccination against rabies in humans is an exceedingly valuable method of preventing rabies, it is not 100 per cent effective. The only method which will assure eradication of rabies is the disposal of stray dogs and the confinement of home-owned dogs until rabies has disappeared from the community. Until rabies in dogs is controlled, we shall continue to have a few human deaths from rabies, such as the unfortunate death of Mrs. Godker."

The information this Committee has received from the various states indicates that rabies can be controlled and the disease has been eliminated from certain areas by quarantine and sanitary police measures alone. This has also been accomplished by vaccination, together with quarantine and strict sanitary police measures. Sole reliance on vaccination alone has not been satisfactory, except in those areas in which the larger majority of the dog population has had prophylactic vaccination and the strays eliminated by destruction. We are aware of the fact that vaccination of dogs against rabies is not 100 per cent efficient. A quarantine should be exercised on all dogs in an infected area during an epizootic.

Your Committee has definite recommendations to make, which are as follows:

1. Strict quarantine measures. Destruction of all stray, ownerless dogs and all other dogs which are not confined according to the requirements of the quarantine regulations.
2. We do not wish to discourage the practice of prophylactic vaccination against rabies.
3. We encourage prophylactic vaccination, although we feel that vaccinated dogs should not be granted privileges over unvaccinated dogs.

The Committee feels that the control and eradication of rabies should be placed in the hands of some official or body who does not have to be guided by politics. We feel that the control and eradication of rabies should be in the hands of the federal government in coöperation with the state government. Your Committee hopes the control and eradication of rabies may be placed in the hands of the federal government in coöperation with the state government.

DR. RINEHART (continuing): When you stop to think about the subject of rabies, when you realize there is only one small thing to do, and that is to have everybody take care of their dogs, I do not see any reason why we cannot eradicate rabies. But we have so many outside influences that affect the control of rabies.

For instance, the other day I noticed an article in the newspaper to the effect that a three-year-old youngster here in Chicago lost his dog. His father spent \$125.00 trying to locate it. The boy became ill, very nervous, and refused to eat. The father would have spent any amount of money to get his boy's dog back. That is just one instance of what we have to face in the program of rabies control.

Mr. Chairman, I present this report to you for presentation to the Executive Committee, for their action. (Applause)

PRESIDENT SMITH: The Chair will entertain a motion to refer this report to the Executive Committee.

DR. DUCKWORTH: I so move.

. . . The motion was severally seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: Dr. Rinehart, I personally want to thank you and your Committee for this splendid report. I believe it is a subject to which we should give more consideration.

. . . The meeting adjourned at 4:40 p. m. . . .

ADJOURNMENT

THURSDAY MORNING, DECEMBER 2, 1937

The third session convened at 9:15 a. m., President R. W. Smith presiding.

PRESIDENT SMITH: We have had many requests this morning to change our program somewhat, because of the importance of the first paper, "Trichinosis in Swine and Its Relationship to Public Health." It seems advisable, therefore, that we have this paper presented as the second one instead of the first, in order that late risers may get their breakfast and get here to hear it.

Dr. Kernkamp has consented to present his paper at this time. We would not have you believe that "Protective Immunization in Swine Diseases" is any less important, because to my mind both of these subjects are very, very important to the swine industry of the United States.

Therefore, we shall listen to Dr. Kernkamp's paper, "Protective Immunization in Swine Diseases." (Applause)

. . . Dr. Kernkamp read his paper. . . .

PROTECTIVE IMMUNIZATION IN SWINE DISEASES

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The suppression, control and eradication of transmissible diseases of live stock are a responsibility of live stock sanitarians, veterinarians and animal husbandmen in general. That they have met this responsibility in the past and are meeting it at the present with respect to several live stock diseases is an accomplishment that can be pointed to with much pride.

The methods and procedures that must be employed to suppress, control and eradicate a disease depend to a large extent upon factors and circumstances that are more or less inherent with the disease. For example, the kind and nature of the disease, the species of animal involved, the numbers of animals affected and the numbers exposed, the epizootic and panzootic aspects of the disease, and the mode of transmission and dissemination are salient factors which must be considered before seriously beginning a program of that sort.

A knowledge of the biological factors peculiar to the disease is of great value to a program which aims at control and eradication. The primary and contributing causes of the disease, their routes of entry and manner of distribution within the body, the period of incubation, the course of the disease, and the clinical and pathological manifestations and immunological reactions and characteristics are some of the biological factors to be considered. Protective immunization is but one of the immunological phases of the problem.

Protective immunization implies the ability to produce in an animal a state or power of resisting the disease which might otherwise destroy or detrimentally affects its life. It further implies that this state or power be artificially induced, *i.e.*, by *vaccination*. While it would be desirable to take from this that the immunity thus conferred be of long duration (*life long*), yet such a free interpretation cannot be made at present. In fact, the duration of immunity may be relatively short in some instances and relatively long in others. The grade of immunity, if we can speak of immunity in terms of grade, may be high and good or it may be low and poor. Thus an immunity of short duration but of high grade may occur in some cases and one of long duration but of low grade in others.

Protective immunization in swine diseases is limited almost entirely, in this country, to the use of hog cholera antiserum and hog cholera virus. In some parts of Europe and Japan, swine erysipelas is reported to have been suppressed and controlled by immunization. In this country, swine erysipelas antiserum has been used quite extensively as a therapeutic agent in acute and subacute cases of swine erysipelas and as a preventive treatment in exposed swine. The evidence indicates that swine erysipelas antiserum is most valuable when used in the early stages of the disease and that its use in affording protection against the disease is much less satisfactory.

Bacterins, vaccines and antiserums of various kinds are frequently advocated for use in connection with the treatment and prevention of disease in swine. Diseases that are manifested chiefly by inflammatory changes of the alimentary tract are often selected to receive bacterin and vaccine therapy. The bacterins and vaccines used for this purpose are generally prepared from microorganisms frequently found in swine suffering from the syndrome. The composition of the bacterin may contain bacteria of a single generic type or of bacteria representing two or more different genera. Bacterin therapy is often used in another syndrome which is marked by disease of the respiratory tract. Here again, the bacterins or vaccines recommended may be prepared from organisms belonging to one or more genera. A third syndrome, and one that is rather loosely described by the term "mixed infection," is another condition for which bacterin therapy is often prescribed. A polyvalent bacterin is available for use in this syndrome.

A definite appraisal of bacterin therapy in swine diseases, viewed especially from the standpoint of protective immunization, is difficult to undertake at this time. Bacterins are used in the hope of ameliorating the disease in affected swine and as a preventive in exposed swine or those which may later be exposed. It is contemplated that the attenuated or dead bacteria or their products will cause the production of antibody substance which, in some way, will react to the benefit of the recipient by causing it to overcome and resist the pathogenic activities of the invading bacteria. The premise for their use has some demonstrative and theoretical justification. However, a careful review of the situation reveals the important fact that the syndromes for which the bacterins and vaccines are prepared are not sufficiently "clear cut" and definitive, either from the standpoint of cause, clinical course, or necropsy findings, to warrant critical analysis. Thus the question of protective immunization in swine diseases resolves itself to the use of hog cholera antiserum and hog cholera virus as a preventive treatment for hog cholera.

Protection and immunity, as they are usually thought of in connection with hog cholera antiserum and hog cholera virus (S-V) treatment, generally convey the impression that the swine so treated are immune to hog cholera for all time. However true this may be, nevertheless there are cases where it does not occur. While the writer is strong in the opinion that the great majority of S-V-treated swine possess an immunity of high

grade and long duration, yet he has definite knowledge that this does not always prevail. This opinion is predicated on the premise that the swine when treated are strong and vigorous and free from marked parasitic or microbial ailment, that they are six to eight weeks of age or older and that they receive a sufficient amount of antiserum of high antibody content and a sufficient quantity of virulent virus.

A record of the results of ten years of experience and observations on the use of S-V treatment in a herd of swine will serve to illustrate the control of hog cholera by protective immunization. The herd is maintained for breeding, exhibition and experimental purposes.

It is the plan to keep from 30 to 50 brood sows each year. About 50 per cent of the brood sows are yearlings (gilts), 43 to 45 per cent are from two to three years old and 5 to 7 per cent are from four to five years of age. In the three- to five-year-old sows the breeding is managed so that they will produce two litters per year but only one litter per year for the younger sows. Approximately 70 per cent of the brood sows are indigenous to the herd and 30 per cent are imported from herds in various parts of the state and nation. Many of the herd boars or sires are produced in the herd, others being imported. The feeding, housing and hygiene in the herd are good. As a general rule the pens and pastures are permanently established and full opportunity for rotation is not afforded. Many of the pastures are plowed and seeded at least every two years. It is the practice to hold in quarantine all imported swine until such time as it is shown that they are free from contagious and infectious diseases. All imported swine are given the S-V treatment during the quarantine period unless accompanied by satisfactory affidavits showing that such treatment had already been given them.

A total of 2,843 young pigs and 71 adult swine were S-V-treated by myself or colleagues during the period covered by this record. Never less than 20 cc of hog cholera antiserum and 2 cc of virus were administered to a single pig. In fact, it was the practice to administer ample doses of these agents (30 to 35 cc of serum and 2.5 to 3 cc of virus per 35- to 50-pound pig). The serum was injected deep into the muscles on the medial surface of the thigh and the virus injected into the muscles at a point which was 20 cm (7.75 inches) or more distant. Less than 5 per cent of the 2,843 pigs received more than one treatment. The few that did receive a second injection of antiserum

only were pigs that became quite sick in from five to eleven days after the S-V treatment. The sickness or illness in this case characterizes what is commonly called a "reaction," and represents a condition where the balance between resistance and infection or immune state and disease is approaching a point that might easily be detrimental to the individual. This situation is not entirely infrequent, but it generally swings in favor of the immune state. Where this occurs we look upon it as being beneficial to the animal and mark it as an individual which develops a high resistance to hog cholera.

The number of periods or times each year when S-V treatments were performed in the herd varied. It depended upon the numbers and ages of the pigs to be treated. For example, pigs that were farrowed in February and early in March would be treated in April or May and those farrowed later in March and in April were treated in May or June, and so on. The average age at the time of treatment for the 2,843 pigs was 51.2 days and the range 16 to 107 days. The number treated when only 16 days old was actually only seven and the next youngest pigs treated were 23 days old. There were seven pigs that reached 107 days of age when treated and the next oldest of the pig group reached 104 days when S-V-treated. It is the plan to arrange the time of treatment to precede or succeed weaning by seven to ten days.

In herds and on premises where it is reasonable to expect that some virulent virus may exist at any or all times, it is always good practice not to allow too great a period of time to pass between weaning and vaccinating. This is based on studies which show that pigs nursing immune dams are less susceptible to hog cholera virus than pigs which have been weaned, although farrowed by immune dams. The experience in the herd in question illustrates some of these points quite clearly. The fact that a certain amount of co-mingling usually occurs between the "just-treated" and "not-treated" but nursing pigs, affords an opportunity of exposure. The results thus far have been that none of the latter contracted the disease, which indicates that they were probably immune, a congenital passive immunity. On the other hand, orphan pigs, the progeny of S-V-treated dams and sires, that were depending on modified cow's milk for their food supply, contracted cholera within a week or ten days when allowed to co-mingle with "just-treated" pigs. Because of this, all orphan pigs are given antiserum only when too young to receive

the S-V treatment and later given hog cholera antiserum and virus.

The fact that the chances of virus becoming disseminated to a greater or lesser extent each time a group of pigs was S-V-treated (six or more times in a year) seems very probable. This being the case, then the dams were exposed and unless they were immune to the disease, they might have obtained enough virus to develop hog cholera. Whether they actually did or did not get sufficient exposure to cause disease we have no way of knowing. The only definite statement we can make is that none of the sows, sires or growing swine (shoats) developed hog cholera. It is our opinion that these animals were immune and that the procedures practiced in this herd were effective insofar as hog cholera control is concerned.

While the results just reported are highly satisfactory, nevertheless the time may come when they will be quite discouraging. This should be expected, since there are many data available to show that S-V treatment for hog cholera is not absolutely perfect. Failures to cause an animal or animals to develop a high grade of immunity or one of long duration do occur. The reason for the failure is not always apparent, but undoubtedly it is related to hypofunctional or dysfunctional mechanisms of immunity which takes place in the pig. Too often the quality of the products used (antiserum and virus) is incriminated as the factor responsible for the failure. This condemnation is generally unfounded and is not justified.

In order to appreciate and more fully understand the phenomenon of immunity, a critical review and study of the known facts and theories of immunity should be undertaken. While the knowledge of the mechanisms of immunity have been learned from studies on antibacterial immunity, nevertheless it is reasonable to assume that the mechanisms of antiviral immunity are not particularly different. A critical and analytical discussion of the cellular and humoral mechanisms involved in immune reactions entails descriptions of complex chemical and physical processes for which time and space do not permit at present. However, the mention of a few of the important points seems desirable. It is important to keep in mind:

1. That the production of antibodies requires a definite stimulus.
2. That the amount of antibody produced is generally proportional to the amount of antigen injected.

3. That a second injection of antigen causes the production of a greater amount of antibody, but that very often a marked decrease in antibody concentration occurs immediately following the second injection of antigen.

4. That the antibody-producing mechanism of the body is capable of responding simultaneously to the injection of two or more antigenic stimuli but that the magnitude of the response is not so great for each antigen as when each is introduced separately with intervals of several days between injections.

5. That the mechanisms concerned in immunity are also, in whole or in part, the mechanisms concerned in ridding the body of infection.

While there are doubtless other points of equal or even greater importance to the whole problem of protective immunization, nevertheless a profound understanding of these must be had before a final and definite appraisal of the value and the use of bacterins, vaccines and antiserums in swine diseases can be made. Protective immunization in swine diseases has its most significant meaning at the present time in connection with hog cholera antiserum and hog cholera virus. (Applause)

PRESIDENT SMITH: Dr. Eichhorn has requested permission to make an announcement.

DR. ADOLPH EICHHORN: I have been asked by several persons whether I would tell them something about the contemplated International Veterinary Congress, to be held in Switzerland next summer. We don't expect, of course, that all of you will participate in the tour, which has been made official by the A.V.M.A., but it is hoped that as many of the veterinarians as desire to participate will make the tour of Europe prior to the Congress.

Along this line, an itinerary has been prepared whereby the important veterinary institutions of eight different countries will be visited, aside from the usual sight-seeing.

The Congress itself promises to be one of the great Congresses, or the greatest Congress ever held. Unquestionably, the setting for the Congress will be splendid; the entertainments which are being planned for the attending veterinarians and their wives will also be something worth while to remember.

I have been asked by the General-Secretary of the Congress to stimulate interest in this Congress in the United States, and I am sure that those who will take the time to attend it will be more than repaid for going.

As far as the tour is concerned, it is in the hands of a very reliable travel bureau in New York, and they will provide all the necessary couriers and conductors, and it is quite certain that the tour will not only be worth while from a professional point of view, but also from the sight-seeing standpoint.

I might say that an early declaration of your intention is important, because during that time of the year travel to Europe is very heavy and it is somewhat difficult to get sufficient reservations on the steamer and the more desirable cabins.

I make this statement in order not to have to answer your questions individually. (Applause)

PRESIDENT SMITH: Now we will return to the first paper on the program for this morning. Yesterday, in my address, I mentioned trichinosis in swine as a health problem, and I was led to do that because of one or two serious outbreaks of the disease among human beings in the East just recently. At the time I decided to make mention of that in my address, I did not know that Dr. Schwartz was to present this paper today. Any diseases of animals that are transmissible to human beings certainly deserve all of the attention and thought that sanitarians can give them. I am sure that we will be most interested in Dr. Schwartz' paper this morning. (Applause)

. . . Dr. Schwartz then read his paper. . . .

TRICHINOSIS IN SWINE AND ITS RELATIONSHIP TO PUBLIC HEALTH

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INTRODUCTION

Trichinosis is a disease of human beings, swine and other animals, and is of interest, therefore, to physicians, veterinarians, and public health and live stock sanitary officials and workers. This disease concerns also farmers and other swine-growers because it is contracted by hogs as a result of certain swine husbandry practices. The meat and meat-packing industries are also vitally affected by the presence of trichinae in hogs, the transmission of these parasites to human beings through the consumption of raw or inadequately cooked or processed pork resulting in lawsuits for the recovery of damages on account of illness or death. This paper discusses trichinosis from the biological standpoint and as a problem concerning public health, live stock sanitation, veterinary medicine, and the meat and meat-packing industries, and outlines methods of controlling this important human and animal disease.

THE DISCOVERY OF TRICHINAE AND THE DEMONSTRATION OF THEIR LIFE CYCLE

Trichinae were first discovered in swine by Joseph Leidy, an American physician and naturalist. Leidy communicated his discovery to the Philadelphia Academy of Natural Sciences in October, 1846; the published report¹ of this communication prepared by the Academy's secretary is as follows:

Dr. Leidy stated that he had lately detected the existence of an Entozoön in the superficial part of the extensor muscles of the thigh of a hog. The Entozoön is a minute, coiled worm, con-

tained in a cyst. The cysts are numerous, white, oval in shape, of a gritty nature, and between the 30th and 40th of an inch in length.

The Entozoön he supposes to be the *Trichina spiralis*, heretofore considered as peculiar to the human species. He could perceive no distinction between it and the specimens of *T. spiralis* which he had met with in several human subjects in the dissecting-rooms, where it has also been observed by others, since the attention of the scientific public has been directed to it by Mr. Hilton and Professor Owen.

In March, 1866, 20 years after Leidy communicated his finding of trichinae in pork, that investigator² explained at a meeting of the same academy the circumstances under which he had made this important discovery. Briefly the circumstances were as follows: While eating a slice of pork, Leidy observed some minute specks in the meat which reminded him of similar spots that he had seen in the muscles of a human cadaver only a few days previously. He saved part of the pork, and upon examining it microscopically he found it to be copiously infested with trichinae. The parasites were all dead, since the piece of pork in question had been thoroughly cooked. It is noteworthy that Leidy was quoted as observing that all meats were liable to be infested with parasites. He stated, however, that there was no danger in this to human beings, provided the meats were thoroughly cooked. Leidy stated that he had satisfied himself by experiment that parasites were destroyed when subjected to the temperature of boiling water.

As far as is known, Hilton,³ a prosector in Guy Hospital, London, was the first to investigate the white, gritty specks found by him in a human cadaver; there is some evidence that similar specks were found by Tiedemann, in 1822, and by Peacock, in 1828. In 1832,^{*} Hilton examined these pathological spots without recognizing, however, any parasites within them. In 1835, Paget, then a medical student in London, found whitish spots in a human cadaver which he dissected in Saint Bartholomew's Hospital. With the aid of Brown and Bennett, Paget demonstrated that the white, gritty spots were capsules which contained spiral worms. These worms were described in the same year by Richard Owen,⁴ and named by him *Trichina spiralis*. In 1895, Railliet⁵ renamed these parasites *Trichinella spiralis* because the generic name *Trichina*, proposed by Owen, was preoccupied and, under the rules of zoölogical nomenclature, was not available for the parasite under discussion.

From the time of the discovery of trichinae in human cadavers until 1860, these worms were regarded as zoölogical curiosities, although, according to Leuckart,⁶ Wood in Bristol discovered

^{*}His observations were published in 1833.

numerous trichinae in the body of a young man who died in 1835, after a three-week illness characterized by rheumatic symptoms accompanied by cardiac and pulmonary inflammation. According to Leuckart, Wood expressed the opinion that the presence of the trichinae might have been related to the rheumatic and inflammatory condition of the patient. It was not until 1860, however, that trichinae were definitely recognized as pathogenic. This came about as follows:

On January 27, 1860, a 20-year-old girl died in the municipal hospital of Dresden, Germany, the suspected cause of death being typhoid fever. On microscopic examination of the girl's muscles, Zenker⁷ found numerous trichina larvae in various stages of development, including larvae that had apparently invaded the muscles recently. However, Zenker failed to find the usual pathological picture of typhoid fever in the course of this necropsy. On investigating this matter further, Zenker determined that, 38 days before her death, the girl had eaten sausage and ham prepared from a hog that had been slaughtered on a farm where she had been a servant. Others who had partaken of this pork also became ill and Zenker was able to demonstrate numerous trichinae in the remaining portions of the meat that were still available. Later Zenker demonstrated trichinae in the girl's intestines that had been preserved in cold storage. With material obtained from the girl's muscles, Zenker, Virchow and Leuckart worked out the essential facts in the life history of trichinae. Leuckart⁸ experimentally infected a hog with trichinous meat and, several days later, he observed symptoms suggestive of an intestinal infection, and fever. The symptoms gradually increased in severity and became complicated by the appearance of muscular stiffness, the animal in question being hardly able to move four weeks following experimental infection. On postmortem examination, five weeks after the beginning of the experiment, Leuckart demonstrated unencysted trichinae in the muscles of the pig.

On the heels of these important discoveries concerning trichinae and their mode of transmission, serious epidemics of trichinosis came to light in Germany. In 1862, there occurred in the town of Hettstädt a massive epidemic of trichinosis with a mortality of 16 percent, due to the consumption of raw pork. Two years later, 337 individuals in a small town in Saxony, having a total population of 2,000, developed trichinosis and, of those that became so affected, 101 died. These two epidemics forcefully demonstrated the rôle of uncooked, trichina-infested pork in the transmission of a serious disease to human beings.

LIFE HISTORY OF TRICHININAE

Knowledge of the life cycle of *Trichinella spiralis* is the result of scientific investigations carried out by various parasitologists and medical investigators, in addition to those already mentioned. Briefly the life cycle is as follows (fig. 1).

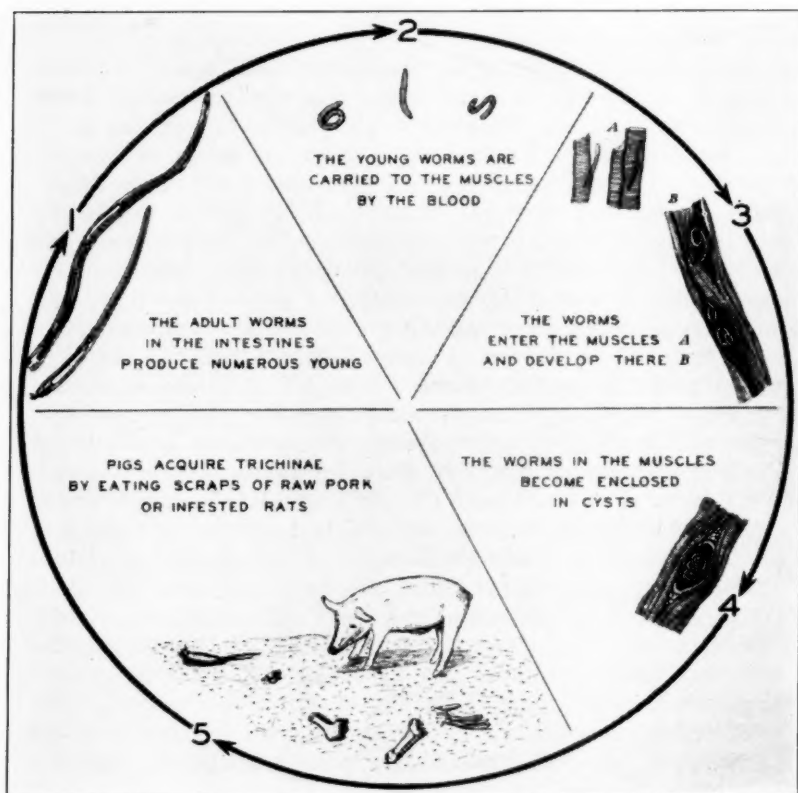


Fig. 1. Life cycle of *Trichinella spiralis*. (After Schwartz)

Infection in a human being, pig, or other susceptible animal, takes place as a result of the ingestion of meat containing live, infective larvae. The infective larvae, 1 mm (about 1/25 of an inch) long, are located in the muscle fibers where they are spirally rolled, and enclosed in connective tissue cysts. On reaching the stomach of a susceptible host that happens to ingest trichinous meat, the larvae become free as a result of proteolytic enzyme

activity, and the liberated worms pass into the intestine with the chyme. Here they become localized, at first among the folds and villi in the upper part of the small intestine, and become sexually mature in the course of two or three days, meanwhile increasing somewhat in size. Following the mating of the worms, the females rapidly attain their growth, reaching a length of 3 to 4 mm (about $1/8$ to $1/6$ of an inch), burrowing more or less deeply into the intestinal mucosa, and commonly reaching the lymph-spaces of the villi. The full-grown males, which attain a length of 1.5 mm (about $1/16$ of an inch), tend to pass out of the intestine shortly after their reproductive functions have been completed. However, adult worms of both sexes may persist in the intestine for several weeks.

The fertilized eggs develop within the uterus of the mother worm, and the larvae begin leaving the maternal uterus four to five days after the mating of the sexes, or six to seven days after the ingestion of trichinous meat by a susceptible host. While the birth of young worms may continue for several weeks, most larvae are apparently discharged by the adult females during the first two weeks of their fertile period.

The new-born larvae, 0.1 mm (about $1/250$ of an inch) long, are deposited in the lymph-spaces through the vaginal aperture of the female trichina, this aperture being located in the anterior part of the worm. The larvae are carried by the lymph to the thoracic duct, thence through the venous system into the heart, and finally into the arterial circulation. Those larvae which are carried to the striated muscles leave the capillaries and penetrate into the primary muscle bundles. The muscle fibers become most heavily invaded nine to ten days after infection, or three to four days after the birth of the young worms has begun. Within ten to 14 days after their penetration into the muscles, the larvae have attained their maximum length, which is ten times their original length; each larva rolls itself into a spiral and becomes enclosed in a capsule.

While the origin of the capsule is still a somewhat debatable point, it is certain that the presence of the parasites in the muscle fibers stimulates the formation of connective tissue around each worm; sometimes, however, two, and more rarely more than two, worms are enclosed in a single capsule. Capsule formation begins about one month after infection, and a thin-walled capsule is readily recognizable about six weeks after infection. Sooner or later, but not earlier than six months after infection, as a rule, the capsules begin to calcify, calcium being

deposited at first at the poles, the entire process of calcification requiring about $1\frac{1}{2}$ years. This accounts for the failure to find the white, oval cysts in infested pork, since most hogs that come to slaughter in this country are approximately six to ten months old. In the experience of the author of this paper, only one specimen, among the numerous samples of pork examined for trichinae in the laboratory of the Zoölogical Division and elsewhere, contained calcified cysts, visible to the naked eye as small, oval, chalky spots, such as were observed and described by Leidy in 1846.¹ The larvae may remain alive in the calcified cysts for a number of years. Sooner or later, however, the larvae die and become absorbed, or undergo calcification and break down into crumbled masses.

Wandering trichinae have been found also in the mesenteric lymph-nodes, peritoneal cavity, pericardial cavity, pleural cavity, myocardium, lungs, the central nervous system and other locations. In these locations only the young noninfective larvae have been encountered; the infective larvae are known to occur only in muscle fibers that are surrounded by sarcolemma. While trichina larvae are known to penetrate the tissue of the heart, they are unable to develop there and degenerate rapidly. As a result of their penetration into the heart tissue, the larvae produce profound inflammatory and degenerative changes, and these parasites may be one of the factors in cardiac disease in man and animals.

It is evident from this account of the life cycle that the entire development of *Trichinella spiralis* takes place in a single host animal which harbors at first the developing and sexually mature worms in its intestine, and later harbors the new generation of worms in the lymph, the blood, and finally in the voluntary muscles.

FACTS LEADING TO THE DETERMINATION OF THE PREVALENCE OF TRICHINAE IN HOGS IN THE UNITED STATES

It could hardly be expected that the discovery of trichinae in hogs would be without its effect on the American meat industry, particularly following the alarming outbreaks of trichinosis in Germany. When Europe became trichina-conscious and alarmed, American meat-exporters had already carried on for a number of years a brisk trade with various countries on that continent. According to Mohler² the export trade in bacon alone from the United States to Europe had become well established in 1879. As a result of the trichinaphobia which held the peoples of cer-

tain European countries in its grip, restrictive measures against American pork began to be promulgated, Italy, Germany, Austria and France following each other in rapid succession. The prohibition against American pork was operative in the countries mentioned by 1881. These restrictions, together with the "Slaughter Order" of Great Britain in 1892, which required that cattle imported from the United States be slaughtered at a port of entry because of the fear of contagious pleuropneumonia, are considered by Mohler⁹ "as the potent and exciting factors in securing legislation for the scientific inspection of meats for foreign and domestic use, and, incidentally, in advancing the cause of veterinary science in the United States." Thus, an observation by Leidy and the subsequent scientific discoveries which followed in its wake were responsible, at least in part, for giving the American people the protection that is afforded by the federal meat inspection service.

On August 30, 1890, the Congress of the United States passed an act providing for the inspection of salted pork and bacon, and on March 3, 1891, the Congress passed a more effective meat inspection act that provided, among other things, for a microscopic inspection of meat from all hogs for export in order that certificates could be issued setting forth their freedom from trichinae.

PREVALENCE OF TRICHINAE IN HOGS IN THE UNITED STATES

As a result of systematic microscopic examinations of samples of muscle tissue from millions of hogs, there accumulated in the records of the Bureau of Animal Industry a vast array of data showing the prevalence of trichinae in swine in this country. These data, which were made public from time to time, showed that out of the total of over 8,000,000 hogs, samples of which were examined microscopically from 1898 to 1906, 1.41 per cent contained live trichinae; in addition, 1.16 per cent contained bodies resembling trichinae or disintegrating trichinae. The total percentage of infection with live and dead or disintegrating trichinae was more or less uniform from year to year during the nine-year period mentioned.

Since it is well known that microscopic inspection is inherently imperfect, and that light and occasionally moderate infections are liable to be overlooked, it is safe to conclude that during the period covered by the data mentioned, approximately one out of 75 hogs contained trichinae probably in sufficient numbers to cause clinical trichinosis in human beings following the consumption of such pork in a raw or insufficiently cooked state. Under

the meat inspection act passed by Congress in 1906, there was no specific provision for microscopic inspection for trichinae of pork intended for export, and the inspection previously made was discontinued.

Following the abandonment, in 1906, of microscopic inspection for trichinae of pork intended for export, no up-to-date information was available up to 1933 regarding the prevalence of these parasites in swine. In 1933, there was inaugurated in the Bureau of Animal Industry, under the direction of the writer, a research project involving a thorough examination of samples of pork muscle tissue for trichinae by the laborious technic of digesting from each carcass about 200 to 250 grams of muscle tissue taken from the pillars of the diaphragm. While microscopic examination of pork for trichinae is a hit-and-miss method, the digestion method as described by Ransom,¹⁰ with certain modifications introduced by workers in the Zoölogical Division, is the most accurate technic known at present for determining the presence or absence of trichinae in pork and any other meat. The information secured by the writer and his associates on the prevalence of trichinae in swine is applicable to research only. This method gives a far more accurate insight into the incidence of trichinae in hogs than was obtained by the routine microscopic inspection practiced by Bureau inspectors from 1892 to 1906.

Out of 6,662 samples of diaphragm muscle tissue obtained from 1933 to 1937 from as many grain-fed hogs originating in Alabama, Florida, Georgia, Illinois, Kentucky, Michigan, Minnesota, Missouri, New Jersey, New York and Ohio, and slaughtered in officially inspected establishments, only 60 (0.91 per cent) were found to be infested with trichinae. Of those found to be so infested, nearly one-third contained between only one and five larvae per 100 grams of diaphragm muscle tissue; slightly over one-sixth of the positives contained only between six and 25 larvae per 100 grams of diaphragm muscle tissue; of the remainder, constituting 52 per cent of the positive samples, one or more trichinae were found per gram of diaphragm muscle tissue, and only about two-thirds of these contained in excess of more than one larva per gram of muscle tissue.

Out of 6,684 samples obtained from as many hogs that had been fed on uncooked garbage, 286 (4.41 per cent) were found to be infested. Of the samples so infested more than two-fifths contained from only one to five larvae, and more than one-fifth contained only from six to 25 larvae per 100 grams of diaphragm muscle tissue; of the remaining samples which

contained one or more larvae per gram of muscle tissue, only two-thirds contained more than one larva per gram of such tissue. Out of 1,987 samples obtained from as many hogs known to have been fed cooked garbage, 11 (0.55 per cent) were found to be infested. Of those so infested, nearly 45 per cent contained only from one to five and about 18 per cent contained only from six to 25 larvae per 100 grams of diaphragm muscle tissue. Of the remaining 29 per cent, which contained one or more larvae per gram of diaphragm muscle tissue, only 0.9 per cent contained more than one larva per gram of such tissue.

These data show an incidence of trichinae in garbage-fed hogs about five times as great as that in grain-fed hogs, and an incidence of these parasites in hogs fed uncooked garbage about eight times as great as that in hogs fed cooked garbage. The data show, therefore, that the feeding of uncooked garbage favors the spread of trichinae to swine and that the cooking of garbage is an effective method of sharply curtailing the incidence of trichinae in garbage-fed hogs.

In general, the incidence of trichinae involved in the series of hogs in question is low. Data to be presented in another section of this paper show that hogs that developed infections with trichinae produced by the experimental feeding of trichinous meat did not show clinical symptoms when the resulting infection was characterized by less than 800 to 900 larvae per gram of diaphragm muscle tissue. In the entire series of over 15,000 hogs involved in the digestion tests to determine the presence of trichinae, only one contained as many as 805 larvae per gram of diaphragm muscle tissue. With the possible exception of this particular hog, not one of the other infested animals under consideration would have been diagnosed as suffering from trichinosis even if all of these hogs had been under the careful scrutiny of a competent veterinary clinician during the period of active infection. The trichina infections in the 357 positive hogs, with the possible exception of the one hog already mentioned, were evidently of the non-clinical type as far as can be judged by the number of larvae present in the diaphragms of these individual host animals.

Data obtained by the writer and his associates in the Zoölogical Division showed that when the infection with trichinae in the pillars of the diaphragm of hogs was such that less than one larva was present per gram of muscle tissue, only one out of eleven positive samples, examined microscopically three times,

actually showed trichinae. When the infection was characterized by as many as three larvae per gram of diaphragm muscle tissue, only approximately 50 per cent of the known positives showed trichinae on microscopic examination. Assuming these findings to have general application, the positive samples in the series under discussion would have been sharply reduced, had these samples been examined only microscopically.

TRICHINOSIS IN SWINE

Considering the fact that a positive diagnosis of trichinosis in human beings can be made with certainty only when the parasites are actually found in the patient, usually following a biopsy, it is not surprising that Hutyra and Marek¹¹ state that trichinosis has not been diagnosed in living swine. In a human being a tentative diagnosis of trichinosis is made on the basis of a chain of clinical symptoms, not a single one of which, or even several taken together, can be regarded as pathognomonic of this disease. However, when all the symptoms are considered together, a presumptive diagnosis is warranted, particularly if the patient can recall having eaten, prior to the onset of symptoms, raw or insufficiently cooked pork, or an inadequately processed or cooked meat food product containing pork muscle tissue. In the final analysis, however, a definite diagnosis of trichinosis involves the finding in the patient of the parasites at some stage of their development.

The clinical manifestations of trichinosis in swine have been established only as a result of observations following experimental feeding of trichinous meat to these animals. The severity of the symptoms in swine, as in human beings, is related to the number of encysted larvae ingested. This accounts for the somewhat conflicting reports relative to the seriousness of trichinosis in swine, as recorded by different investigators. In general the work of the early investigators showed that swine manifest symptoms following the ingestion of relatively large numbers of trichinae, and that indefinite or no symptoms are shown by these host animals following the ingestion of relatively small numbers of these worms.

Thus, Leuckart⁶ concluded that only about 50 per cent of hogs that had been infected experimentally showed visible symptoms. According to Leuckart, the hogs that were seriously affected showed intestinal disturbances three to four days after eating trichinous meat. In the severest cases, Leuckart noted intestinal irritation, fever and pain, and on the eleventh day after infection, he observed a sharp increase in temperature

with evidence of muscular inflammation, stiffness, difficulty in masticating and breathing, and severe emaciation. Leuckart found that about 50 per cent of the hogs showing severe symptoms succumbed to trichinosis. In recovered cases, this investigator observed the subsidence of the symptoms beginning about six weeks after infection; recovery was complete, the recovered animals taking on good weight.

In the course of experimental investigations on trichinae in hogs carried out during the past few years by Lloyd A. Spindler, of the Zoölogical Division of the Bureau of Animal Industry, under the direction of the writer, observations were made on the reactions of these host animals to various doses of larvae administered. Although these observations were incidental to other objectives, they are of value in showing the varying degree of susceptibility of pigs to different-sized doses of trichinae. When the pigs in question were killed, an estimate was made of the number of larvae per gram of diaphragm muscle tissue by the digestion method proposed by Ransom.¹⁰ The results of these observations, together with other pertinent data, are given in table I.

An examination of the data presented in table I shows that pigs 1 to 6 weighing from 100 to 150 pounds, showed no readily observable symptoms following the ingestion of trichinous meat containing varying numbers of infective larvae, the number of larvae ingested by individual pigs of this group ranging from 1,200 to 35,000. Since a single female trichina may give birth to about 1,000 larvae, the individual pigs in question might have contained from about 500,000 up to about 17,000,000 larvae in their muscles. This estimate is based on the assumption that 50 per cent of the larvae administered developed into females and that each of the latter developed to fertile maturity and produced a normal brood of young worms. It is doubtful, however, that such theoretical expectations are ever realized in the case of experimental and natural infections. It is fairly safe to conclude that pig 6 that received 35,000 infective larvae probably developed an infection characterized by the encystment of several million larvae in its muscles, without exhibiting, however, any noticeable clinical symptoms.

Although a 200-pound hog (No. 7) was apparently unaffected following the ingestion of 75,000 larvae, two pigs weighing 100 pounds (No. 9) and 130 pounds (No. 8), respectively, showed symptoms, those in the lighter pig being decidedly pronounced and terminating in death seven days after infection. The re-

TABLE I—Results of experimental infection of pigs with *trichinae*.

Pig	WEIGHT (KG)	LARVAE ADMINISTERED		SYMPTOMS SHOWN BY PIGS	LARVAE PER GRAM OF DIAPHRAGM MUSCLE
		TOTAL	PER KG		
1	45.45	1,200	26	None	10
2	56.82	10,000	176	None	100
3	61.36	20,000	326	None	100
4	68.18	30,000	440	None	300
5	54.55	25,000	458	None	280
6	54.55	35,000	641	None	322
7	90.91	75,000	825	None	900
8	59.09	80,000	1,354	Pig "off feed" from 14th to 27th day after infection Diarrhea and prostration beginning the third day after in- fection; animal died 7 days after infection	Not determined
9*	45.45	80,000	1,760	Pig "off feed" and inactive from 15th to 23rd day after in- fection	Not determined†
10	34.09	90,000	2,640	"Off feed" 7 days after infection; prostrated 10 days after infection; died 10 days after infection	860
11*	52.27	100,000	1,913	Symptoms as above; died 12 days after infection	Not determined†
12*	52.27	100,000	1,913	Symptoms as above; died 14 days after infection	Not determined†
13*	52.27	100,000	1,913	Symptoms as above; died 15 days after infection	Not determined†
14*	52.27	100,000	1,913	Symptoms as above; died 18 days after infection	Not determined†
15*	52.27	100,000	1,913	Symptoms as above; died 20 days after infection	Not determined†
16*	52.27	100,000	1,913	Prostrated 12 days after infection; died 24 days after in- fection	Not determined†
17*	45.45	120,000	2,640		1,820
18 to 23	68.18 to 72.72	120,000†	1,650 to 1,760	Animals obviously sick 10 to 12 days after infection, re- maining so for 10 to 14 days; refused feed for several days; stiff and moving with difficulty	1,800 to 2,700
24	104.54	120,000	1,148	Diarrhea 4 days after infection; off feed and inactive from 4th to 20th days after infection	1,200
25	68.18	125,000	1,833	Slight; off feed for about 2 weeks, beginning 12 days after infection	1,000
26	40.91	174,000	4,253	"Off feed" about 1 week after infection; refused feed 10th to 12th day after infection; drank large quantities of water; muscular stiffness pronounced; pig hardly able to get up	2,100

*Succumbed to the infection; all other pigs in this series were killed to obtain a supply of trichinous meat.

†The larvae are killed by digestion before they attain the infection stage.

maining pigs of this series received doses of from 90,000 up to 174,000 larvae and all of them showed more or less severe symptoms. Each of six pigs (Nos. 11 to 16), weighing about 115 pounds and receiving a dose of 100,000 larvae, succumbed to the infection at various times between the tenth and 20th days following the ingestion of larvae. It is interesting to note that the top of the mercury column in the thermometer used in taking the temperature of pig 16, about one hour before this animal died, was above the mark 110°F. Pig 26, weighing 90 pounds and receiving 174,000 larvae, showed severe symptoms but it did not succumb to the infection.

It is evident from these data that infections resulting from the administration of trichinae may be measured by the number of larvae per gram of diaphragm muscle tissue. Applying this yardstick to the data given in table I, it is clear that in the series of experimental infections under consideration, infections characterized by the presence of up to 900 larvae per gram of diaphragm muscle tissue, developed without any noticeable symptoms. With a single exception (pig 7), however, all of the pigs that were found to contain 860 or more larvae per gram of diaphragm muscle tissue did show more or less severe symptoms.

While the number of larvae per gram of diaphragm muscle tissue bears in a general way a relation to the estimated size of the infecting dose (table I), particularly in the case of the lighter infecting doses, this relationship is subject to rather wide variations. For instance, pigs 18 to 23, weighing between 150 to 160 pounds at the time of infection with the 120,000 larvae each, showed up to 2,700 larvae per gram of diaphragm muscle tissue, while pig 26, weighing 90 pounds at the time of infection with 174,000 larvae, contained only 2,100 larvae per gram of diaphragm muscle tissue. That many larvae may go astray in the course of their migration through the body has already been mentioned in the account of the life cycle of *Trichinella spiralis*. It is probable that other factors, including the host's defense mechanism, may be involved in the degree of the resulting infection.

In the hope of securing more precise information on the symptoms of experimental trichinosis in swine than was afforded by the data already presented, the writer, in collaboration with Underwood and Cross, infected seven pigs with varying doses of trichina larvae. These host animals were under careful observation at the National Agricultural Research Center, Beltsville, Md., throughout the period during which the severe symp-

toms would be expected to manifest themselves, and for some time after this period. During the period of observation, the pigs were carefully scrutinized, temperature, pulse and respiration rates being taken at frequent intervals and a general physical inspection being made at each observation.

Four pigs weighing 20.45, 20.91, 22.27 and 22.27 kilograms (45, 46, 49 and 49 pounds), respectively, were fed trichinous meat, the number of larvae administered to the individual pigs being 10,000, 15,000, 20,000 and 25,000, respectively. The four pigs were under careful observation for 50 days, two days prior to and 48 days following the feeding of the infected meat. During this period the animals were examined on 37 different days, without showing the slightest deviation from the normal. On postmortem examination, 50 days after infection, no macroscopic lesions of any kind were found. The trichina content of these pigs per gram of muscle tissue was estimated by obtaining and digesting 200 grams of muscle tissue taken from different portions of the body, including the diaphragm. The number of trichinae per gram of mixed muscle tissue was 52, 46, 77 and 149, respectively. The weights of these host animals, determined shortly before they were killed, were 37.25, 30.91, 35.91 and 36.82 kilograms (72, 68, 79 and 81 pounds), respectively. Considering the ration fed, the increase in weight was nearly normal.

Three other pigs, weighing 22.73, 22.5 and 19.32 kilograms (50, 49½ and 42½ pounds), respectively, were infected with larger doses of larvae, the doses being 50,000, 75,000 and 100,000 larvae, respectively. These pigs were kept under observation for 83 days, during which they were carefully scrutinized three times before and 19 times after infection. The examinations of these host animals were made about four to five days apart in most instances, except during the second and third weeks of infection, when more frequent observations were made. Three days after infection, the pigs developed diarrhea. These host animals showed pale or slightly injected mucous membranes at various times. About 18 days after infection, some evidence of poor physical condition began to manifest itself and, four days later, the pigs appeared to be "off color" with indefinite symptoms; there was evidence of a slight edema of the eyelids and vulva. Five weeks after infection the pigs appeared normal.

The temperatures of the pigs remained normal except in the case of the pig receiving 75,000 larvae and developing the heaviest infection, as determined later by the number of larvae per

gram of mixed muscle tissue. This animal showed a temperature of 105°F., or slightly above or below this on the 8th, 11th, 15th and 41st days after infection; occasionally this animal showed a rapid pulse. When these three pigs were killed, 79 days after infection, they were found to contain 840, 1,535 and 1,215 larvae, respectively, per gram of mixed muscle tissue. The weights of these pigs immediately before they were killed were 31.7, 23.41 and 22.04 kilograms (69.75, 51.5 and 48.5 pounds), respectively, indicating a failure to gain weight at a normal rate. It is evident from these data that even careful observations of pigs following experimental infection with large doses of trichinae failed to reveal any symptoms that were definitely suggestive of trichinosis or any other specific disease.

CONTROL OF TRICHINAE IN SWINE

It is evident from the data on the prevalence of trichinae in grain-fed swine that the persistence of these parasites in nearly 1 per cent of these host animals is conclusive proof that much still remains to be done to reduce, if not to eliminate altogether, the small residuum of these parasites which, under certain conditions, may be distinctly pathogenic to their porcine hosts. Without minimizing the importance of trichinae to the live stock industry of the United States from the viewpoint of their injuriousness to hogs, the chief importance that attaches to these parasites is their bearing on human health. In the United States, human beings acquire trichinae as a result of eating raw or inadequately cooked pork, the only conclusive exceptions to this statement being a small outbreak of trichinosis in California which was traced to the consumption of jerked bear meat (Meyer)¹², and several sporadic cases traced to bear meat.

Although the evidence presented in this paper shows that the vast majority of the infested swine examined by the digestion method had light or practically negligible infections, the data indicate conclusively that sources of trichina infection exist on farms in the Atlantic Seaboard States, the North Central States, the Middle West and elsewhere. Among the possible sources of trichina infection on farms in the areas mentioned are the contents of the scrap-barrel, offal from hogs butchered on farms and in country slaughter-houses, dead hogs, dogs, cats and rats which are not properly disposed of and are available to pigs, and are probably eaten by them, particularly when the latter are affected by some nutritional deficiency.

Since the incidence of trichinae in the 6,484 hogs fed on raw garbage was 4.41 per cent, nearly five times as great as

that in the series of grain-fed hogs, it is safe to conclude that the feeding of uncooked garbage favors the spread of trichinae to swine. Although the bulk of garbage that is fed to swine consists of vegetable matter, raw pork bones with adhering meat, and trimmings containing small portions of swine muscle tissue are also likely to be present. As a small percentage of swine muscle tissue may contain living trichinae, the continued feeding of uncooked garbage is apt to result and does result in the continuation of the vicious cycle of trichinae in a relatively large proportion of such hogs.

As an alternative to the elimination of garbage feeding altogether, cooking of garbage to a temperature sufficient to destroy the vitality of all live trichinae that may be present in pork contained in it, is a procedure that should be given careful consideration by garbage-feeding establishments and adopted as an alternative to the feeding of garbage as collected. The data already presented show that out of nearly 2,000 samples of diaphragm muscle tissue obtained from hogs known to have been fed on cooked garbage, only about 0.5 per cent were found to be infested with trichinae, and of those so infested nearly 50 per cent contained negligibly small numbers of these parasites. Another possibility, more applicable to the farm than to garbage-feeding establishments, is the elimination of meat from feed intended for hogs.

The control of trichinae in swine has been of interest to the American government since 1881. As already stated, the earlier investigations on trichinae by scientists of the Bureau of Animal Industry were stimulated largely by the restrictions placed by various foreign governments on the importation of pork from this country. Actually, however, nearly all of the pork shipped from the United States to Europe in the last few decades of the 19th century was exported in the cured state, and it has been known for a long time that thorough curing is destructive to trichinae. To meet the slurs cast by certain European countries on the American live stock industry, Dr. Daniel E. Salmon, the first chief of the Bureau of Animal Industry, detailed to Germany Dr. Charles W. Stiles, at that time zoölogist of the Bureau, to investigate outbreaks of trichinosis in that country, alleged to have resulted from the consumption of pork imported from the United States. Dr. Stiles¹³ was unable to trace definitely a single case of trichinosis occurring in Germany between the years 1881 and 1898 to pork from the United States. He did, however, trace about one-third of over

6,000 cases of trichinosis that occurred in that country, during the period mentioned, to pork which had been examined microscopically by German inspectors and certified by them as free from trichinae. These facts, elicited by the Bureau of Animal Industry, strengthened the Bureau's position as regards the futility of microscopic inspection of pork as an effective safeguard against human trichinosis, and led to investigations which established the present method of handling the trichina problem under federal meat inspection procedure.

As a result of discoveries by Ransom^{14, 10} that trichinae in pork could be destroyed by refrigeration for a continuous period of not less than 20 days at a temperature not higher than 5°F., the establishment by Ransom and Schwartz¹⁵ that the thermal death-point of trichinae is 131°F., (137°F. for official purposes), and finally the work of Ransom, Schwartz and Raffensperger¹⁶ on a number of practical methods of curing various pork food products customarily eaten without cooking, the following procedures have been adopted.

Fresh pork, and ordinary varieties of cured pork intended to be cooked in the home and elsewhere, are subjected to no treatment or inspection, since no practical treatment to destroy trichinae and no economically practical system of inspection to discover these parasites have as yet been devised. All products containing pork muscle tissue, to be sold as cooked products, are heated or cooked under the supervision of inspectors, according to methods which are known to insure a sufficiently high temperature to destroy in all parts of the meat the vitality of any trichinae that may be present. For all products which are not cooked or heated to a sufficiently high temperature, but which are nevertheless intended to be eaten by the consumer without being cooked, various alternative methods of preparation are prescribed, including the refrigeration procedure already mentioned, smoking, curing, drying and other processes. All the individual methods prescribed have been shown by careful experimentation to be destructive to the vitality of trichinae.

In addition to the protection thus afforded to consumers of the classes of products mentioned, the Bureau of Animal Industry has called attention at frequent intervals to the danger of acquiring trichinosis as a result of the consumption of raw pork or meat food products containing raw or inadequately cooked or cured pork muscle tissue. Through leaflets, bulletins, press releases, posters, radio broadcasts, and official correspondence with health officers and the public generally, the facts available in the

Bureau's files have been given wide publicity. The statistical information on the prevalence of trichinae in swine in this country has been published repeatedly as a warning to the public that the consumption of raw or inadequately cooked pork may be fraught with serious, if not fatal, consequences. Practically all the constructive measures designed to protect the American public from the danger of acquiring trichinosis originated in the federal Bureau of Animal Industry.

Since, as already stated, trichinosis and non-clinical trichina infections in human beings in this country are due to the consumption of raw or inadequately cooked pork or inadequately cooked or cured meat food products containing pork muscle tissue, it is evident that the eradication of trichinae from hogs would eliminate trichinosis from human beings. The ultimate eradication of trichinae from hogs in the United States is a problem confronting live stock sanitary officials. Bureau of Animal Industry inspectors engaged in field work and others have emphasized for years the advantages of the swine sanitation system for profitable swine-production. Under the sanitation system of swine management, most of the known sources of trichinae are precluded. Live stock sanitarians throughout the United States could, by concerted effort, sharply reduce the prevalence of and ultimately eradicate trichinae from swine by educating swine-producers on sanitary methods of management.

The eradication of human trichinosis is a problem confronting public health officials primarily with supplementary aid from live stock sanitary officials. Adequate cooking of pork in the home and in public eating-places, adequate processing under state or local meat inspection of meat food products containing pork muscle tissue, if of kinds that are customarily eaten without cooking, and establishment of meat inspection in communities that lack this public service, will help to reduce and ultimately eliminate trichinosis from man. A more comprehensive campaign of education under the auspices of public health workers and educators on the importance of adequate cooking of pork as a health safeguard will do much to reduce the danger of trichinosis to a minimum.

While clinical trichinosis in human beings in the United States is far from being an alarming problem, it is nevertheless a medical problem that should not be neglected, because trichinosis is a serious, painful and, sometimes, a fatal disease. The definitely known cases of clinical trichinosis in human beings in this country probably do not exceed 5,000 or 6,000. The more or less

recent findings on the incidence of trichinae in nearly 2,300 human cadavers that were necropsied in hospitals in California, the District of Columbia, Massachusetts, Missouri, Minnesota, New York and elsewhere, are of greater interest from zoological and statistical standpoints than from a medical standpoint. These data do show, however, that a strikingly large percentage of the cadavers in question contained varying numbers of trichinae, too small, however, in most instances to have had, or known to have had, any medical significance.

It is obvious from these findings that some individuals intentionally or unwittingly eat pork that has not reached in all of its parts a temperature of 137°F., which is known to be lethal to trichinae. The need of adequate cooking of pork in the home, in restaurants and elsewhere should be emphasized by public health physicians, nurses, school teachers, and others engaged in medical and educational work. A well-directed campaign of this sort will be productive of constructive results, particularly if coupled with vigilance on the part of public health officers in the regulation of the operation of garbage-feeding establishments on the outskirts of cities and towns in such a manner as to eliminate feeding of garbage containing scraps of uncooked meat.

SUMMARY AND CONCLUSIONS

This paper contains information on the discovery of trichinae in swine and in human beings, the recognition of the pathogenicity of these parasites, their life history, important outbreaks of human trichinosis in Germany due to the consumption of raw pork, the restrictions imposed by various European countries on the importation of pork from the United States, the establishment and abandonment in this country of microscopic inspection of pork intended for export to the countries that imposed these restrictions, and data concerning trichinae in about 8,000,000 hogs from which samples were examined up to 1906. In addition, information is given on recent findings on the incidence of trichinae in hogs, as follows:

Out of 6,662 samples of pork obtained from grain-fed hogs originating in various hog-growing centers of the United States, only 60 (0.91 per cent) were found to be infected with trichinae. Out of 6,684 samples of pork obtained from hogs fed on garbage as collected, 286 (4.41 per cent) were found to be infected, while out of 1,987 samples of pork obtained from hogs that had been fed on cooked garbage, only 11 (0.55 per cent) were infected;

the samples from the garbage-fed hogs, like those from the grain-fed hogs, were examined by the digestion method.

The logical inference from these data is that the feeding of uncooked garbage favors the spread of trichina infection among hogs, and that cooking of garbage is an effective method of sharply reducing the incidence of trichinae in this class of hogs.

An analysis of the data, with reference to the samples of pork that contained trichinae, shows that the degree of infection with these parasites was rather light, and that if the samples in question had been examined microscopically, a large proportion of the positives, discovered by the digestion technic, would have been overlooked.

Data obtained as a result of experimental infection of pigs with varying doses of trichina larvae, show that the host animals in question showed no readily recognizable symptoms when the resulting infection was characterized by the presence of less than 800 to 900 larvae per gram of diaphragm muscle tissue. Pigs with heavier infections did show clinical symptoms during the active stage of the disease, including digestive disturbances, muscular stiffness, inappetence, fever, edema, and other conditions, all the symptoms not being shown by each animal experimentally infected with relatively large doses of larvae, and the symptoms as a whole not being diagnostic of any particular swine disease.

The evidence presented in this paper shows that swine may succumb to heavy infections with trichinae, death occurring as early as seven to ten days after infection.

Considering the minimum number of trichinae per gram of diaphragm muscle tissue associated with clinical symptoms during the active stage of the disease, only one out of the 357 trichina-infested hogs that came to light as a result of digesting samples from 15,333 hogs, had an infection sufficient to have been productive of symptoms, the infections in the remaining 356 positive hogs being apparently of the non-clinical type, as far as can be judged by the data presented in this paper.

The control of trichina infection in swine and the ultimate eradication of this disease from these host animals involve improved live stock sanitation on farms, the elimination of meat from the scrap barrel, the control of rats, burning or deep burial in quicklime of animals that die on the farm, and an adequate diet for swine to prevent the development of a capricious appetite. Since the feeding to hogs of garbage as collected appears to be

the main source of trichina infection, garbage fed to swine should be cooked to kill trichinae that may be present in scraps of pork in the garbage. Garbage that is definitely known to contain no meat or bones need not be cooked. The sale, by cities and towns, of uncooked garbage for the feeding of hogs is a dangerous procedure and should be discontinued in the interest of the live stock industry and as a public health measure.

Since human beings acquire trichinosis as a result of eating raw or inadequately cooked pork or inadequately cooked or processed meat food products containing pork muscle tissue, a comprehensive campaign to educate the public regarding the danger of acquiring trichinosis from the sources mentioned should be undertaken by public health officials, teachers, nurses, and others engaged in educational work. Public health officials should regulate the operation of garbage-feeding establishments so as to prohibit the feeding to swine of garbage that has not been properly cooked, unless the garbage is known not to contain meat scraps and bones.

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DISCUSSION

PRESIDENT SMITH: Thank you, Dr. Schwartz, for a very interesting paper.

We have with us this morning a man who is very much interested in this subject. He was formerly Swine Specialist in the Bureau of

Animal Industry. I believe he is a charter member of this Association. I refer to Mr. E. Z. Russell, now of Maryland. I am glad to ask Mr. Russell to open the discussion on Dr. Schwartz' paper.

MR. E. Z. RUSSELL: Dr. Schwartz' paper has brought out a great many facts regarding trichinosis that are of value not only to sanitary officials but to scientists, live stock producers and the public in general.

It is my purpose to discuss this question from a somewhat practical standpoint, particularly from the standpoint of feeding garbage to hogs, as I happen to be one of those fellows who do this.

Without any question, the health of the public is the first and foremost consideration. At the same time, we must look facts squarely in the face, and I hope, in my brief talk, to bring out a few facts as they present themselves to me.

Dr. Schwartz shows quite clearly that trichinosis is produced from hogs being fed raw garbage to a considerably greater extent than hogs that have been fed grain or cooked garbage. Yet the number of clinical cases in this country now is relatively small when we consider the vast number of times that each human consumes pork.

Dr. Schwartz has said that when pork is heated to a temperature of 137° trichinae are killed. If you will heat pork to a temperature of 137° and look at it, unless you are a person who likes raw meat you would not eat it. It looks almost raw at that temperature.

Of course, a considerable percentage of the people consume pork, and have no way of knowing to what degree of temperature the pork they consume is heated. For instance, people who eat at hotels and restaurants depend entirely on the cooks in the kitchen to cook the pork properly.

The detection of the disease in live animals by the process of regular antemortem inspection is certainly impossible. The same is undoubtedly true regarding carcasses. In years past I have had the privilege—if you call it such—of looking over a good many carcasses of hogs that have been known to have been fed garbage. However, these observations were made in the West, in the packing plants at Salt Lake City, Los Angeles and San Francisco, and I certainly couldn't tell any difference between those carcasses and carcasses of grain-fed hogs.

Every known fact should be candidly and fairly presented, but it should not be presented in a manner that is apt to get the public wrought up and scared, and afraid to eat meat.

It is only pork that is affected by this disease; but what percentage of the public knows that? I will confess that a large percentage does know that, but in fairness to the live stock producer, and in fairness to the consumer, the facts should be made known. They are certainly entitled to a fair and just treatment.

Now, let us consider what seem to be some of the practical facts regarding the feeding of garbage to hogs. The percentage, as I have said, shows that raw garbage contains a higher percentage of infection than cooked garbage or grain, and that if the garbage were thoroughly cooked the source of infection would be practically wiped out.

But even then we have this rat proposition; that may have some effect, and rats are not only to be found around garbage-feeding plants but in some farmers' feed-lots and other places as well. Perhaps some of these large feed-lots, where they feed grain to the hogs, have rats also.

One day I visited a feeding-plant, and before starting out the manager said, "Here; take this." He handed me a big cane, bigger than

any hickory cane I ever saw. I said, "Golly! The hogs must be fierce." "Hogs, nothing!" he replied. "I'm not giving it to you for the hogs; look out for the rats." And I found there were plenty of rats around that plant.

What about cooking garbage? Is it practical? As a garbage-feeder, in a very small way, I feel quite sure that it is not. Garbage fed to hogs is largely transported from the cities where it is picked up by trucks, usually containing from two to five tons or more, carried to the farm, spread out on the platforms (either plank or cement) and the hogs permitted to eat it. If it were necessary to cook that garbage there would have to be a vat of sufficient size to hold the load.

Another plan might be to have the bottom of the tank to the truck lined with steam pipes, perforated, and then you would have to have a steam cooker or something to make that effective, and there would have to be considerable pressure in order to force the steam through the pipes, or the perforations, which might become filled with the product.

It will be readily seen that in either method a considerable amount of expense would be involved in the way of labor and otherwise. On a considerable number of the farms feeding garbage, the fuel would have to be bought, either coal or wood, and even on farms where plenty of wood is available it is a considerable expense to cut the wood and haul it up and fire the heater, and so on.

For these reasons it seems to me that cooking of garbage is an impractical proposition. One of the largest feeders of garbage in this country recently made the statement that if he were compelled to cook the garbage he feeds to his hogs, he would be forced out of business.

Another question comes up. "Is it necessary to cook all garbage?" Apparently not. The only source of infection is in the meaty part of the garbage, and probably the bones of the meaty part constitute more than the meaty part.

Can this meaty part be taken out practically? I don't want to say right now; I have never tried it. Since this question came up a few days ago, I have been down to the farm only once, when the boys were feeding garbage to the hogs, and I didn't have time to get in with the rake and see what the garbage consisted of. But I don't know but that it may be a practical thing to do.

There are two general classes of garbage. There is the hotel and restaurant garbage, and the household or alley garbage. I believe it is safe to presume that there is twice as much meat and bones in hotel and restaurant garbage as in household garbage. So, of course, the feeder of restaurant garbage entirely would be subject to considerably more expense in cleaning out the meaty part of the garbage than would the fellow who happens to be a feeder of household garbage entirely.

However, a good many feeders feed both. I don't know what the expense would be, and I am inclined to think that it may be a practical problem. Of course, the meaty part that is taken out could be cooked and fed to the hogs, and the cooking of that part would not be a laborious or expensive procedure.

We are sadly in need of data that could be obtained by feeding garbage in various conditions under closely controlled experimental conditions. Dr. Schwartz gave you some figures on the matter of grain-fed and raw-garbage-fed hogs, of something over 6,000 head; but he has no information as to the history of those hogs, their production and sanitary conditions under which they were grown, which I believe is rather important. If an experiment of that kind could be undertaken—let us have a check on corn and tankage, the usual feed, and

then another with hotel garbage as is, and household garbage as is, and both of them with the bones and meat taken out—then, after we get those hogs, the carcasses should be under the supervision of scientists capable of determining their condition so that we will know exactly what exists under those conditions. Then let's go further and cook the meat, test it for palatability, and learn something about that. In addition, some valuable information would be obtained as to the actual feeding value of garbage as compared to grain, of which we know but mighty little. That, of course, is from the feeder's standpoint; however, it would be a fine thing if we knew something about it.

The health of the public must be considered first. The economic side of this question can hardly be kicked out. I haven't any figures, I don't think anyone has, as to the amount of money that is saved to the tax-payers of the various cities and villages throughout the United States by farmers picking the garbage off the streets and disposing of it. If we will stop to think a moment, we will know it runs into the millions and millions of dollars, a load which the tax-payer would have to assume. And, generally speaking, tax-payers are not looking around for ways to add to their taxes in these times.

Then, there is another consideration. These fellows who are feeding garbage—many of them—are wrapped up in their work. To them it is a business, just as a grocery store, a shoe shop or the fellow feeding hogs on the farm. The blow to them, if garbage should be required to be cooked, as I see it, would mean practically the elimination of feeding garbage.

So far nothing has been said about the percentage of hogs fed garbage on farms, and that probably originates from the meat scraps that have been cut off in the kitchen. I feel sure that if farmers would take that scrap from the kitchen and feed it to the chickens they would get a lot more value out of it than they would by feeding it to the hogs, and that part of the infection could then be eliminated, or reduced to a considerable extent.

Dr. Schwartz said that there have been clinical cases of between 5,000 and 6,000 people in something like 70 or 75 years who had this trouble, and I am informed that about five per cent of these cases were fatal. I am just thinking about the chances we take in eating pork. You know, it must be thoroughly cooked. That is well known; but I asked a man yesterday, who has given the greater part of his life to the meat industry, not as a packer but in the study of meats, how many times a week the average person ate a piece of pork. He said, "Five times, anyhow." Pork means ham, bacon, sausage for breakfast. Perhaps you will have bacon for breakfast, a ham sandwich for lunch, and fried pork chops for dinner. There, gentlemen, you have three times a day of possible infection. Multiply that by the days in the month and the months in the year, and then multiply that by 70 years. I started to figure that out the other day, and found I would wear out my pencil before I got through, so I quit trying.

This may look foolish, but is it not a fact? It is a fact, gentlemen, and when we consider that out of the immense number of people who eat pork in 70 years, and then consider that only 5,000 or 6,000 contracted the disease, it isn't very staggering. Are we not subjected to other diseases to a far greater extent about which we are not saying very much. Rabies, for instance. I understand there is an average of about 50 fatal cases each year. Well, let's see.

If trichinosis has been known for 70 years, multiplying that by 50, gives us 3500 fatal cases. In all of these cases that are not reported, is it not fair to assume that an equal number of cases would not be reported in one disease as in the other?

If rabies has caused the death of 3,500 people in that length of time, and trichinosis has caused the death of about 300 people, we will take the top figure that Dr. Schwartz gave us, 6,000, and multiply that by 5 per cent, and we have about 300. Still, we are not getting excited about rabies.

I hope you won't misunderstand me. I am not trying to minimize the efforts to wipe out trichinosis, not in the least. I am just trying to present some facts as they occur to me.

Now, what about some of these other diseases? We have the common cold and influenza and pneumonia and typhoid fever. I have no figures available. I might have gotten them if I had had the time. We all know something about them, and when we compare the percentage of fatal cases in those with the fatal results in trichinosis, again it isn't so much.

As Dr. Schwartz said, the people have been warned again and again of the danger of eating pork that is not thoroughly cooked. That could possibly be carried to the point where the public might begin to wonder what in the world is the matter with all this propaganda against eating pork, and they will forget the words "properly cooked."

In justice to the live stock producer and the consumer alike, that should not be. We should let the people know what the facts are insofar as we can, and should not try to create big headlines and make the situation sensational. You know, newspapers like to get hold of this stuff. I guess that is the way they live—through big headlines. We should be careful along that line, not careful to the extent, though, of hiding the true facts. We should not create a revolt or even a fear of eating meat, because in the minds of some people the thing might be twisted around and they would think of meat and not of pork.

Taking all these facts into consideration, to me there is certainly no justification for rushing headlong into regulations that are not known to be practical and which, consequently, will not work. You can try to make a fellow do something, and if you find out after a while it won't work, it's a whole lot worse than if you never tried to make him do something.

So let's consider this thing more seriously and more with the idea of having success after we know something more about the question involved.

Who is going to offer the solution to the problem, and how is the problem going to be solved? First, I believe we need more known facts under closely controlled experimental conditions. Then it is up to the scientists to give us these facts; it is up to the sanitary officials to use those facts as best they can, based on the facts they know; and it is up to the hog men, the feeders of hogs, to coöperate with these other agencies.

If we will do that, I rather think we are going to get some results that will become effective. Thank you.

DR. A. E. CAMERON: Mr. President, ladies and gentlemen, I have been greatly interested in Dr. Schwartz' address on trichinosis, and he gives a practical solution, the cooking of garbage. The last speaker has doubted the advisability of this measure, I should judge, but it has been tried and is practical in application.

In some countries it is a law that garbage must be cooked, and while the law has not been initiated for the purpose of preventing trichinosis, the fact that it has been initiated brings out some striking points.

In the first place, I would like to remind you that at the present time it is not believed that trichinosis is transmitted to pigs extensively from rats; in spite of a common belief, pigs as a rule will certainly become adept at killing rats, but they do not, generally speak-

ing, eat them. Experiments have been carried out which show that rats were actually dying on the premises, while the pigs on the same premises were practically free from trichinosis.

Garbage feeders who cook garbage are of the opinion that the hogs do better and they get better economic results. In Canada it is unlawful to feed collected garbage without a license, and when the license is issued the garbage must be cooked and the premises must be kept in a sanitary condition.

A survey is being made at the present time of the prevalence of trichinosis in Canada, and while I cannot give you figures, because the survey is not completed, as far as it has gone the incidence is very low. Of course, I would not venture to say that that is the result of cooking garbage. A very important factor in support of cooking garbage which is not in relation to trichinosis is the fact that it will prevent the spread of some other diseases. At least there is some evidence to that effect.

In Canada we definitely believe that hog cholera is prevented, to some extent, by the cooking of garbage. In Britain, in order to prevent the spread of foot-and-mouth disease, they have a law which requires the cooking of meat scraps.

You have under consideration in this country the importation of Argentine meat, and it might be well to think it over. (Applause)

PRESIDENT SMITH: We thank you, Dr. Cameron, and are glad to receive these words from our good neighbor to the North. Dr. Eagle, you may have two minutes.

DR. R. F. EAGLE: In the beginning I wish to add my commendation and compliments and congratulations to this wonderful presentation of Dr. Schwartz. I believe that over the years I have had many opportunities to look into the subject of trichinosis, and yet I got more out of this paper this morning than I got out of all my readings over the years. I know the same can be said by the other members present today.

It seems to me that this matter should be approached from a practical standpoint, yet carefully. After all, we are going to have to choose between protecting the public health and properly safeguarding one of the leading agricultural projects of this country—the swine industry.

The swine industry can easily be placed at a great disadvantage in this country in its competition with other food commodities if public opinion—whether right or wrong—determines the manner in which the public are going to receive any product, whether edible or not.

Therefore, these so-called glaring headlines in papers concerning this disease are not, in my opinion, going to prove very beneficial to the cause. They are going to have the effect of lessening the popularity of pork as a part of the diet of our American citizens.

I don't believe there is any intention on the part of anyone to destroy any industry, that is, anyone in this room. I speak now and refer particularly to garbage feeding. I am very hopeful that something can be worked out that will permit these garbage people to continue in a practical way; but after all, if it cannot be worked out, it seems to me rather than to jeopardize the interests of the American swine industry, we had better jeopardize the interest of the garbage industry—and when I say the swine industry, I want to add, jeopardize the interests of the swine industry and public health.

I repeat that something should be worked out to allow these garbage people to operate practically; but if it cannot be done, then they, like any other industry, must submit to the most practical procedure to guard this great swine industry and the public health.

Our government and our states thought nothing of killing the animals themselves to control foot-and-mouth disease. Now, certainly some pro-

cedure that is not going to call for the killing of animals or destroying any property should be applicable to this garbage situation. We have heard a great deal about the subject here lately. I do not believe it has been definitely understood, and I am very happy to have been here to hear Dr. Schwartz say that in his opinion the control of trichinosis is a responsibility of live stock sanitarians.

He very definitely defined the responsibilities of the public's health. There has been a great deal of literature spread over the United States. You are seeing it in the public press, stating that this is a meat-packing problem. Some of you folks here may not know it, but I am an employé of a meat packer. I might say I am one of the charter members of this Association, and continue my membership in it.

We do know that in the meat-packing industry this government is doing more to protect the American public against the possibilities of either infection or infestation, whichever it might be, in connection with animal diseases, than any other organization in the world. We know that we are surrounded with all kinds of regulations to make impossible the distribution of meats that would have the least possibility of carrying trichinae to the American public.

It so happens that only about 17 per cent of a pork carcass, slaughtered under federal inspection, has any possibility of reaching the public in a raw state, and in all probability much less than that amount actually reaches the American public. Much has been said about this subject as to how the packers can control it. The packers and the government are doing everything they can, and are willing to go further in their coöperative attitude, but they cannot under any circumstances control the manner in which swine are produced, or the manner in which they are fed.

Dr. Schwartz went on further to state that even with the microscope oftentimes it is doubtful to diagnose this infestation in the carcass. Therefore, it would seem to me that while the packer is willing to coöperate, we have another problem in this country. Sixty-five per cent of the swine slaughtered in this country (approximately that much) come under the control of the federal government.

What is being done to the pork—whether it be sausage, hams or whatnot—of that other 35 per cent which is being consumed by the American public? Today the American packer's interest is being placed in jeopardy as a result of misinformation and a lack of proper understanding on the part of many concerning this issue. If the packers' interests are affected and the distribution of pork products is affected, I need not tell you men who are in the live stock business that it is going to reflect adversely on the swine producers of this country.

My two minutes are up; before I finish, may I say that I have been reading different programs of state veterinary medical associations throughout the country, and invariably I find someone presenting the subject of trichinosis. I want to say to you men who are interested in conserving the best interests of the American swine industry that this subject must be approached in a careful way, and that every possible way of offsetting this glaring headline of publicity should be followed; and in the presentation of these subjects, if I may advance this suggestion, I hope that it will be handled in a way that it is being handled here today, behind closed doors, because it is fraught with real danger. Again, I say it is going to be up to the live stock sanitarians, as I see it, and not the packers, to place this situation where everyone can get behind a practical plan and proceed in the best interests of, first, the public health; second, the swine industry; and if we can save these other affiliated industries that fit into it, let's save them, too! (Applause)

MR. W. G. WEST: May I say just a word? I wish to endorse what Dr. Eagle said about going carefully on this matter of trichinosis. I am not so sure but that the proposed placards by the Bureau of Animal Industry, which they propose to post in meat shops throughout the country, might be a harmful thing. If we are going to consider all these possible avenues of picking up infection, which I gather from Dr. Schwartz' lecture this morning are quite remote as compared to the great volume of pork consumed, I believe after all that we must consider carefully the producers of pork if we are going to broadcast such information over the land. If we do that it is going to cut seriously into the producer's business of this country.

I should like to ask this question with regard to the great volume of pork now being imported from Poland. Has careful attention been given to the possible bringing into this country of trichinosis from that source?

DR. SCHWARTZ: We have been taking samples of pork from Poland and from other countries. We have made a very careful examination, and have not found live trichinae; we have found dead trichinae in that pork, which indicates that the products that have been offered for importation have been processed in accordance with the requirements of the meat inspection regulations of the Bureau of Animal Industry.

PRESIDENT SMITH: Now we will listen to a paper on swine erysipelas, by Dr. Frank Breed, of Lincoln, Nebraska. (Applause)

. . . Dr. Breed presented his paper. . . .

SWINE ERYSIPELAS

Its Distribution, Increasing Importance and Control

By FRANK BREED, Lincoln, Neb.

History is just as important to a study of the various infectious diseases and maladies of live stock, as it is to the study of political or economic factors in the life of a nation. It is by the records made today about the live stock diseases and their control, that tomorrow we will be able to build a more solid foundation for the development of a more valuable live stock industry.

With these plain and simple statements we wish to point out the importance of keeping, in definite form, in the different states and territories, more complete records on the infectious live stock diseases, regardless of species affected.

To obtain the data for the presentation of this subject, we distributed 120 questionnaires asking when erysipelas was recognized in the state or territory, how the diagnosis was made, the percentage of swine specimens each year which were positive for erysipelas, and so forth. These were sent to state veterinarians or live stock sanitary authorities, all the U. S. Bureau of Animal

Industry hog cholera control veterinarians, educational institutions and extension divisions, and privately owned laboratories, both research and commercial.

The response was exceedingly gratifying. All individuals to whom these questionnaires were sent seemed eager to cooperate and furnish the requested information as promptly as possible. Most of the educational and extension divisions, and the privately owned laboratories, both research and commercial, returned what appeared to be highly accurate and concise information. The questionnaires returned by a large number of the state veterinarians and live stock sanitary control commissioners were not very definite except that they did state whether the disease existed within the state or not. As to the number of cases within their commonwealths, the answers were exceedingly vague. It is for this reason that our introductory remarks relative to recorded facts concerning infectious diseases were made. Therefore, permit us at this point to recommend to this organization that careful studies be made and methods set up whereby more accurate and complete information may be procured from our various live stock sanitary officials about the incidence of infectious live stock diseases.

We appreciate the fact that the information we have obtained in reviewing the questionnaires is of significant value, but by no means positively accurate. Our analysis has necessarily been based on the summary of reports on *specimens* received at institutional and private laboratories. We did not attempt to obtain this information from the practicing veterinarians throughout the United States because it would have been an almost endless task and because it would have been necessary for us to question the diagnosis of the disease where laboratory assistance had not been obtained.

Furthermore, it has been necessary to select those questionnaires which were returned by those having laboratory diagnosis service at their command. It has been impossible, in many instances, to attempt to interpret or weave into the picture the information contained in the questionnaires returned by the live stock sanitary officials. There are only now and then data of sufficient value that they could be used in attacking this problem. But in spite of these possible limitations, we believe it is likely that the conclusions reached approach the true state of affairs with regard to the prevalence of erysipelas.

This information has given us a picture which will show the origin, and approximate time of the recognition of this disease, and its gradual spread into new territories.

The organism, *Erysipelothrix rhusiopathiae*, has been known to exist within the bounds of the United States for more than a half-century. It has been identified with various disturbances in different species of domesticated animals. But for more than 40 years, it has been said that the disease, swine erysipelas, did not exist in the United States as far as any economic importance was concerned. But for the past seven years, and certainly at the present time, we have every right to question the soundness of a continuation of this attitude.

From the questionnaires returned, we can now definitely state that this organism has been identified in some form as a cause of swine maladies in 28 of the 48 states, two of the states failing to report on the questionnaire. Diagnoses have been made by the employment of all recognized methods—culturing, agglutination, pigeon inoculation, and microscopically. The most constantly reported methods were microscopic, culturing and pigeon inoculation.

The first time that the positive importance of this organism was made public was when Creech connected it with diamond skin disease in 1921. Secondly, it was reported by Parker, Lockhart and Ray, in their studies of the causative factors of enlarged joints in swine, coming to the U. S. B. A. I.—inspected abattoirs, in 1924. The real recognition came in 1930, when Fosterman, a practitioner of South Dakota, called to our attention the fact that swine erysipelas existed in an acute septicemic form, causing heavy losses among a large number of swine, involving a large number of herds. Until this date, swine erysipelas was still considered a nonentity when tabulating the diseases of our swine industry.

Following Fosterman's report, in 1931, of the prevalence of this disease, there became an entirely different picture. The positive and undeniable facts presented in January, 1931, caused all the agencies in any way connected with the swine industry to be conscious of the existence of swine erysipelas. This fact is shown by the questionnaires returned. Most of the middle western states report the positive diagnosis of swine erysipelas, either in 1931 or 1932, most of our definite information dating from 1932. By this time we were convinced that erysipelas was a definite disease entity and one with which it would be necessary to reckon.

ITS SPREAD THROUGHOUT THE UNITED STATES

In the early months of 1931, the U. S. B. A. I., through their representatives, Drs. C. H. Hays and C. F. Harrington, made a

tentative survey of the disease as it then existed in South Dakota and positively diagnosed the disease (mainly by the culture method) on twelve farms, in seven townships located in three counties. So we will use the year 1931, and the state of South Dakota as our "time" and "place," in presenting the scenes to follow. The U. S. B. A. I. made a survey, in 1932, which shows that the disease was positively diagnosed, either by culture or by blood agglutination test, to be present on 46 farms in 26 townships and in eleven new counties. The records show that there were 158 cases of infectious diseases of swine reported during this year and 78 (49 per cent) were swine erysipelas. It is also shown that all the 14 counties in which the disease exists are east of the Missouri River.

In this same year, the disease became recognized in various other middle western states: Colorado, Nebraska, Minnesota, Iowa, Missouri, Wisconsin and Illinois. All appreciated the fact that this disease was becoming of economic importance, except in Wisconsin, where it has been of little consequence. In the same year, 1932, the disease also appeared in New York State. According to the records, the incidence of the disease that year in Colorado and in New York was the most severe these states have had since its recognition.

During 1933, Wyoming, Kansas, Ohio and Mississippi were added to the list of states positively recognizing the disease. In 1934, New Jersey, Maryland and Georgia were added, but the disease has been of little significance in New Jersey and Georgia. In Maryland, however, erysipelas was positively diagnosed in 13.2 per cent of all swine specimens examined in 1934. Only one state was added in 1935—Florida—where it is stated that the disease continued to exist in the northern and western portions, somewhat generally, so that it has become prevalent to the extent of approximately 5 per cent of all the swine diseases.

By 1936, the disease had become quite widely recognized. This year brought in North Carolina with five specimens, Indiana with three specimens, Oklahoma with two specimens, Montana with three specimens, Utah with one and Idaho with two. Four more states were added in 1937—Pennsylvania, Tennessee and Washington with one case each, and North Dakota with five cases.

With this limited amount of information, it is quite evident that the disease, originating in what we may call the center of swine population of the Middle West, has spread more rapidly and has become of greater importance within the areas comprising the Mississippi Valley.

ITS INCREASING IMPORTANCE IN EACH STATE

Now to return to the state of South Dakota, we find that the records show that, during the year 1933, the disease appeared on ten new farms within the same townships and counties as in 1932. It recurred on nine farms included in the 1932 report. In comparing the incidence of the disease in 1933 to that of 1931 and 1932, a decided decrease is observed. Where erysipelas was 49 per cent of all types of infection in 1932, but 15 per cent of the swine diseases in 1933 was erysipelas. (Or, in actual figures, there were 78 positively diagnosed cases of erysipelas as compared to 80 cases of other types of infection, including hog cholera, in 1932. In 1933 there were 60 positively diagnosed cases of erysipelas and 336 cases of other types of infections).

However, the disease slightly increased in distribution in 1933, for it occurred in one new county located west of the Missouri River.

The fiscal year ending June 30, 1934, showed a decided decrease in all types of infectious swine diseases in South Dakota. There were recorded only three positive cases of erysipelas, or 2 per cent of all the types of infectious diseases, including hog cholera. Only three counties, all east of the Missouri, showed the presence of the infection.

During the years 1935 and 1936, there is no record of the presence of the disease whatsoever, and there were but eight cases of cholera recorded for 1935 and 26 for 1936.

In explanation of the decrease in erysipelas and, in fact, in all swine diseases, we might quote from a personal communication from Dr. C. F. Harrington, of the U. S. B. A. I., Pierre, South Dakota.. He says:

In 1932, in South Dakota the disease swine erysipelas was widespread over the east river section. In 1933, this state was visited by a severe drouth and the swine population was greatly diminished under a government program of buying and slaughter. The incidence of swine erysipelas was diminished to almost zero. In 1934, the cattle-buying program was begun. We were all so busily engaged in that program that little or no attention was given to swine diseases. The years of 1935 and 1936 showed practically no swine erysipelas, because, presumably, of the diminished herds and the hot, dry weather.

But the following statement from the same communication is of intense importance:

This year of 1937, however, was comparable to 1932 in climatic conditions—wet in the spring, then hot in June. In consequence of this, swine erysipelas made its appearance again throughout all the old infected districts and in some new districts.

Turning our attention to neighboring states, we find that the disease had become so prevalent in the state of Nebraska that Van Es, in 1936, published a most comprehensive review of the disease as it occurs in continental Europe and in this country, in which he made particular reference to a definite survey. From this publication we quote as follows:

Precise data pertaining to the incidence and distribution of erysipelas in this country are not available at this time. That the problem associated with it deserves serious consideration, at least in Nebraska, is indicated by the results of a survey undertaken by this station. In connection with this project, 281 outbreaks of acute swine disease were investigated and, in not less than 24 per cent of this number, swine erysipelas proved to be the malady involved.

It is quite possible that, if a similar survey were made of other Mississippi Valley states, the importance of swine erysipelas in comparison with other acute infectious diseases of swine would be exceedingly surprising.

In 1932, the year stated as the beginning, we find that Minnesota records nine cases of swine erysipelas which represents 3.9 per cent of all their swine specimens examined. In the same year, Nebraska reported six positive cases (1.76 per cent). Iowa reports five cases (approximately 1 per cent). Illinois reports two outbreaks recognized in 1932. Missouri comes into the picture, showing approximately 6 per cent positive.

The year 1933 showed practically all of the middle western states recording a decided increase in the incidence of the disease, with the exception of the decided drop reported by Minnesota and South Dakota.

The year 1934 appeared to be the approximate peak of this particular wave in most of the middle western states, Nebraska reporting 15 per cent, Iowa 3 per cent, and Illinois a 300 per cent increase over 1933. That year Maryland recorded the appearance of the disease with 13.2 per cent of the specimens positive.

The year 1935 showed a decided drop in South Dakota, Nebraska and Iowa, with another increase for Minnesota. Illinois incidence remained the same. In this same year, Maryland had a 7 per cent increase.

The year 1936 shows a pronounced decrease for South Dakota, Minnesota and Nebraska, a slight increase in Missouri, and a decided increase in Illinois, which showed a 400 per cent increase over 1933. The report for 1937 from Minnesota apparently shows the incidence of the disease to be much on the down grade, while in South Dakota the disease has reappeared in practically all its formerly infected areas and is estimated to represent

TABLE I—A summary of the information obtained from the questionnaires showing the approximate relation of the incidence of *swine erysipelas* to other infectious swine diseases, in the states in which records were obtainable, and the disease of economic importance.

YEAR	S. D.	NEB.	IOWA	MINN.	MO.	KAN.	IND.	ILL.	OHIO	N. Y.	MD.	FLA.
1931	20%	No record	1.6%	No record	No record	None	None	None	No record	None	None	None
1932	49%	1.76%	1.0%	3.9%	6.0%	None	3%	None	0.7%	None	None	None
1933	15%	7.2%	3.0%	0.3%	5.9%	1.0%	None	6 areas	4.2%	26%	None	None
1934	2%	15.4%	1.2%	1.8%	11.0%	1.0%	None	17 areas	8.3%	20%	None	None
1935	None	8.4%	2.9%	3.8%	9.0%	10.7%	2%	15 areas	2.1%	None	13.2%	5%
1936	None	6.0%	2.6%	0.3%	14.3%	None	3%	24 areas	None	None	20.0%	5%
1937 (to Oct. 1)	30%	10.8%	21.0%	0.5%	21.0%	1.88%	3%	No report	1.7%	10%	10.25%	5%

States in which the records show the disease has not been diagnosed: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, Delaware, Virginia, West Virginia, South Carolina, Kentucky, Tennessee, Alabama, Arkansas, Louisiana, Texas, New Mexico, Arizona, Nevada and Oregon.

about 30 per cent of all the acute infections in swine. In Iowa the records showed the greatest percentage of the disease since it was first recognized. For the first nine months of this year, Iowa records 21 per cent of all the swine specimens to be positive for erysipelas. In Nebraska, covering approximately the same period of time, the disease increased from 6 per cent in 1936 to 10.8 per cent for the first nine months in 1937. Minnesota shows a slight increase from 0.3 per cent in 1936 to 0.5 per cent for the first nine months of 1937.

Ohio reports the presence of the disease following the same general curve, with a peak reached in 1934, a decided decrease in 1935 and no cases in 1936. So far in 1937, the disease is again reappearing.

Therefore, it appears that the greatest incidence of the disease lies in that territory extending from the west slopes of the Appalachians to the east slope of the Rockies. In other words it comprises the great Mississippi, Missouri and Platte valleys. It also appears that the disease had a tendency to spread eastward from its original point of recognition. From year to year, there appeared to be an increased number of states east and somewhat south of South Dakota which either first recognized the disease or recognized it from the standpoint of greater importance. The information also suggests that the disease has become far more prevalent in eastern states during and following the drouth in the Middle West, which naturally resulted in an exportation of swine from these areas to regions having a sufficient food supply.

The information gathered also tends to show that the disease can and does recur from year to year on certain individual farms. It has also a tendency to point to the possibility that the disease occurs in cycles of three or four years, reaching its height in that time and then gradually receding, with a tendency to become prevalent in approximately another four-year period. A statement that the disease occurs in cycles may be somewhat premature. But an analysis of the information dating back to the year 1930 suggests that it may so occur, simulating somewhat the cycle commonly referred to in hog cholera. Of course, it may be that the disease appears in new territory and that when it is first recognized, the local practicing veterinarian takes greater precautions in the differential diagnosis, submitting a greater number of specimens to the laboratories. Then, as he becomes more familiar with the history, clinical symptoms, temperatures and postmortem findings, he may make his own differential diagnosis without submitting specimens. This might

naturally cause a fluctuation in the appearance and so-called disappearance of the disease, which an analysis of data furnished by laboratories shows.

But, on the other hand, this would not satisfactorily explain the gradual rise to the *second* three- or four-year peak, since veterinarians are by then familiar with it, and yet the increase in specimens occurs. So we feel that in all probabilities it is actually the incidence of the disease causing this period fluctuation rather than the increased knowledge of the disease and the greater ability of the practicing veterinarian to recognize it.

At the present time, it appears that we might quite accurately estimate the percentage of erysipelas in relation to other acute infectious diseases to be from 10 to 17 per cent, for the middle western section of the country as a whole. These figures cannot be taken as more than an opinion, but even so they give us an idea of the importance of this disease to the swine industry at the present time. These percentages are calculated by taking into consideration the existence of the disease in some territories where the percentage is as low as 1, and including other territories where it has been recorded as high as 25 to 30. By the inclusion of these two extremes, on the prevalence of the disease, we feel that throughout our densely populated swine areas, our figures of 10 to 17 per cent will hold comparatively accurately.

It is quite evident, from the information gathered, that swine erysipelas is becoming a more important factor as one of our acute infectious diseases of swine. It extends into practically all states where there is a substantial swine population. The losses from this disease are not entirely calculated from the standpoint of mortality. There are decided economic losses which, in most instances, may take a greater toll than that taken by death.

Relative to the types of this disease, an attempt was made to tabulate the various types in percentages, but this was impossible. However, the questionnaires tend to show that in the majority of instances, the early recognition of the disease was of the acute type, this being followed by the chronic types, principally the articular form, and as the disease remained within the given territories, the acute types seemed to decrease and the chronic forms predominate.

The control of this disease is the great problem facing live stock sanitary officials, the veterinary profession, and the swine-raiser. In the control of erysipelas it is necessary to take into consideration the resistance of the organism, which apparently

is much greater than commonly considered. It has been reported by Dunlap and Graham that it requires twelve days of direct sunlight to destroy it. When the virulent organism is present in meat and bacon, it will remain viable for 170 days in these products in the pickling process. In smoked hams it remains viable for over three months. In putrefied meat it remains viable for at least four months.

Chronic carriers which do not appear to be visibly sick may continue to remain on premises and distribute the infection to the soil through the urine and feces, and thus succeeding generations of young, growing and susceptible pigs are exposed.

One of the greatest menaces to the swine industry, contributing to the spread of acute infectious diseases, is the community sale, which has been developing so rapidly in scope during the past few years. This may be considered as the source of the spread of the infection into non-infected territories. There is no question but that there is too great a traffic in the so-called "tourist" swine, which are transported from one community sale to another in the hope that some unsuspecting feeder will eventually take them off the market. Too many animals are moved from premises on which outbreaks occur or in the neighborhood of outbreaks, to sales barns in far distant regions even into other states. In these instances they are frequently offered for sale as feeder pigs from drouth area farms. It may be contended that the unthrifty condition of the animals is due to lack of food, or of the proper kind of food.

Such traffic in this class of live stock should be stopped or some means established so that one may determine whether the animals have been previously offered for sale. It might be feasible to demand of the community sale operators where feeder pigs are offered for sale, that these swine be subject to the rapid agglutination test and must be found negative before sale. It is also possible that the demand should be made that all swine not sold at their first community sale should be definitely and permanently identified so that if they are removed to another sale the fact would be definitely known.

It is quite evident from the information obtained from this survey that the disease, swine erysipelas, has spread into too great an area and has become too prevalent in those areas. Some means of control is necessary if we are to prevent further spread into areas not highly infected at this time. It is felt that swine erysipelas, especially of the acute type, should be added to the list of reportable diseases. It might be advisable in newly in-

fectured areas to require that a quarantine be exercised in order to prevent its spread to non-infected neighboring farms, and also to prevent the transportation of these animals to community sales.

What are we to do to control this disease within known highly infected areas, such as certain farms, townships or counties? Until the present, the use of anti-swine erysipelas serum, administered to all visibly sick and apparently well animals on a given farm, has been practiced with quite satisfactory results in the majority of cases. But there are some areas in which the disease has so consistently reappeared with each farrowing of pigs, that this method of control is not handling the situation and is becoming too expensive.

It is reported in Europe and South American countries where the disease exists as does cholera in the United States, that the simultaneous use of erysipelas serum, together with the living culture, has given satisfactory results.

The U. S. B. A. I. has, in the past, taken the stand that the disease is not sufficiently prevalent and is not widespread enough to justify this type of immunization in the United States. I wish to make it very plain that I agree wholeheartedly. It would be a mistake to place the control of this disease at this time upon the same basis as that of hog cholera. Without a doubt swine erysipelas would become more prevalent within those states now having the greatest incidence of the disease, and would also be established in new areas within the states where the disease does not now exist.

This naturally presents the question: What are we to do to control this disease, or at least keep it within the already infected territories and prevent its spread to those territories now having little or no evidence of the disease? It has for some time been felt by the writer and others interested in swine diseases, that there are certain areas in which the use of simultaneous vaccination for this disease could do no harm. This should be approached cautiously and on a definite and well-thought-out plan. If the U. S. B. A. I. could see its way clear to coöperate with the live stock disease control agencies of those states in which the disease has been most prevalent, in the formulation of such a plan, it would assist materially.

The plan in mind would include an arrangement to permit the state authorities to designate a state controlled laboratory to prepare the living culture to be supplied to competent practicing veterinarians. This would be used simultaneously with anti-swine erysipelas serum produced commercially. This living culture would be used on those premises on which the disease has

been positively diagnosed by one of the recognized scientific methods, and particularly on those premises where the disease has appeared from year to year. This federal and state activity might be entered into as an experimental project and kept entirely under state and federal supervision and control until such a time that the control should be relinquished to the practicing veterinarian or the method discontinued.

This survey of swine erysipelas has been made and presented for the purpose of bringing to light the importance of this disease as it occurs in the United States today. We feel that we have shown the rapidity with which the disease has spread over comparatively large areas in a short period of time. This is the first report of its nature presented on this disease before this body and I hope that, as the years pass by, we will have progress reports which are far more definite and complete on the incidence of swine erysipelas. In closing I wish to extend to each individual, federal, state, educational, extension service, and private laboratory, my sincere appreciation for the assistance rendered to make this survey and report possible. (Applause)

PRESIDENT SMITH: Thank you, Dr. Breed.

The next paper is by Dr. W. A. Aitken, of Merrill, Iowa, dealing with "A Practitioner's Problems in Swine Sanitation and Disease Control." (Applause)

. . . Dr. Aitken presented his paper. . . .

A PRACTITIONER'S PROBLEMS IN SWINE SANITATION AND DISEASE CONTROL

By W. A. AITKEN, Merrill, Iowa

One hesitates to attempt the discussion of such a threadbare subject as sanitation, because the fundamental principles involved have been so thoroughly discussed in the past and because the need for and details of sanitation seem so obvious. However, when we consider its supreme importance in any live stock venture and the appalling thoroughness with which sanitation is sometimes neglected, undoubtedly we are justified in the repetitions necessary in keeping the subject constantly agitated.

Live stock sanitary problems vary with the species and due to their peculiar mode of life there is no species in which sanitation is of more importance than in swine. Sanitary problems also vary with natural conditions such as the climate, the contour and the soil; and with man-made conditions such as the concentration of, the confinement of and the traffic in animals.

In these North Central States our swine diseases are quite uniform but their intensity varies chiefly with the concentration of swine. When our forefathers broke these prairies, their swine problems were mostly with visible enemies, including marauding animals, human or otherwise, and with our extremely variable weather conditions. For protection they built small tight enclosures or pig-pens, often with small straw sheds for houses. As the swine industry developed and hog profits increased, our appreciative swine-raisers, in the approved American fashion, built ever bigger and better swine-barns. The climax was reached shortly after the World War, when many of these structures were suggestive of cathedrals erected in honor of his lordship the hog. Unfortunately, some of these stately swine-barns have seemed to serve more as mausoleums for the hog than as cathedrals. With their high ceilings, roof windows and concrete floors they were so cold and damp that the unsophisticated swine preferred other quarters, especially old straw-stacks. Either the cold houses or the half exposures around the stack were ideal conditions for the generation of swine flu and pneumonia. Others eventually stood in the midst of yards so infested with swine diseases that swine profits were turned to very real deficits. The greater the investment in such swine equipment the more reluctant was the farmer to forsake it for more hygienic quarters and therefore the more disastrous was his investment.

In the early days, swine diseases were rare and since markets were relatively inaccessible, any sick hogs were allowed to recover or to die in peace at home. Each farmer raised only a few pigs and if they all died his loss was not so great. As swine-raising became more popular, breeders increased the number raised on each farm. In their quest for improved types and breeds, swine were shipped long distances and more breeding hogs were traded and moved about in the neighborhood. The expansion of cattle-feeding as well as hog-feeding farms and the many recent local crop failures have greatly increased the traffic in feeder pigs. The more hogs raised on a farm the more swine pastures had to expand, so the shorter became the distance between neighboring herds. This increased traffic and increased concentration of swine has vastly multiplied the facilities for the spread of existing infectious diseases.

New swine diseases have appeared rather regularly in the past quarter-century and have in time usually spread throughout the swine belt. Since the advent of any new disease is seldom compensated for by the disappearance of an old one, we now find our swine problems vastly changed from those of the early set-

tlers. Imagine, if you please, the consternation of a Rip Van Winkle who, although a modern veterinarian and swine practitioner of 28 or 30 years ago, would awake today and attempt to resume his swine practice. With no serums or other biologics, with only hog cholera, swine plague, and a few general diseases for his choice in diagnosis, how utterly obsolete his knowledge, his vocabulary and his equipment would be.

COMMON SWINE DISEASES OF THE CORN BELT

For convenience of discussion we might classify the common infectious swine diseases of today as follows:

- A. Sporadic, Non-Contagious Highly Fatal, Bacterial Infections.
 1. Pulmonary edema.
 2. Pneumonias.
 3. Septicemias (usually suipestifer infection).
(Erysipelas often kills one or two and disappears).
- B. Contagious, Virus Diseases with *Short-Lived Infection*.
 1. *Hog cholera*.
 2. Swine influenza.
 3. Swine variola or pox.
- C. More or Less Contagious, Usually Bacterial or Parasitic Diseases with *Long-Lived Infection*.
 - I. Acute Contagious:
 - a. Hemorrhagic enteritis or swine dysentery (cause unknown).
 - b. Acute enteritis—probably suipestifer or colon type.
 - II. Chronic, Bacterial Diseases, Low or Non-Contagious:
 1. Infectious stomatitis of baby pigs.
 2. Rhinitis or sniffles (bull nose).
 3. Pulmonary infections.
 4. *Necrotic enteritis*.
 - III. External Parasites:
 1. Mange.
 2. Lice.
 - IV. Internal Parasites:
 1. Lung worms.
 2. Stomach worms.
 3. Ascaris or roundworms.
 4. Thornheaded worms.
 5. Whipworms.
 6. Coccidia.

Please realize that this classification is incomplete and may be untenable in many ways but is suggested merely for convenience and brevity in bringing these infectious conditions up for discussion. Erysipelas, for instance, does not fall exactly into any of these groups. While the method of combating each disease has specific measures, yet the general principles involved in the control of the diseases in each group are quite similar.

The sporadic type (group A) probably is a result of a temporarily lowered resistance rather than the virulence of the infectious agent. The disease often terminates too quickly to permit of treatment but any prophylactic treatment of the balance of the herd will usually bring perfect results. It would probably have been the same with no treatment. Isolation and strict sanitary measures should always be invoked in an attempt to remove the source of the infection.

The virus type infections (group B) require a specific treatment for each disease but in addition sanitary measures to reduce the chances of complicating infections and to rid the premises of the disease.

The diseases in the last group (C) are usually transmitted directly by contact with the diseased hog or indirectly from infected quarters. They tend to remain in the herd and on the premises until the chain of exposures is definitely broken. They therefore should be the most vulnerable diseases, yet their control requires the greatest vigilance and persistence. This group might be designated as "sanitary diseases." At least sanitation is the major factor in their control.

The diseases listed under subgroup I of group C are dreaded because of their rapid spread, their failure to respond to treatment, their high fatality and the longevity of the infections in contaminated quarters.

Hemorrhagic enteritis or swine dysentery is an especially alarming affliction. Too often the whole herd is exposed, the quarters contaminated and deaths occur before the owner is aware of any unusual illness. While some claims are made for biologics in treating this disease, a few carefully checked experiments have been very disappointing in my hands. Strict sanitary measures and treatment for enteritis are desirable but usually will not control the disease. Immediate removal of the well pigs to *intermediate* quarters where they must be closely observed for new cases for several days before moving them into permanent, clean quarters is the best procedure.

Other outbreaks of acute enteritis, probably due to *suipestifer* or colon bacilli infections, take a course quite similar to this

hemorrhagic form but hemorrhages are absent and they are often less acute. At times they seem quite contagious, while in other herds cases appear at variable intervals. Control measures should be the same as for hemorrhagic enteritis. Hogs will sometimes do well in yards infected with these enterites in winter while the ground is frozen, especially if under snow, only to have the disease reappear when the spring thaws come.

The chronic diseases in subgroup II are well publicized because their effects are so obvious and they return to the same premises so regularly. They are usually considered as filth diseases, yet are often found in quarters that appear relatively clean and sanitary. Many are visible external infections such as ulcerative stomatitis, bull nose or snuffles, and even infectious sores scattered over the pig's body.

The so-called yard infection bronchitis and pneumonia are indicated by a chronic cough, unthriftiness and emaciation. Post-mortems usually reveal localized chronic gray hepatization of the lower portions of the lung, lung abscesses or pleuritic adhesions.

Necrotic enteritis is the most common disease of this subgroup. It is readily recognized, due to the chronic scouring and emaciation. The affected pigs may die of starvation in a few weeks or may linger on as runts and as veritable brooders of infection. Since the course and spread are slower than in the acute enterites mentioned above, the treatment is more effective although far from satisfactory. Biologics are worthless but the disease can often be checked and some cures obtained by medication and special feeding. Some good hog men seem able to hold necrotic enteritis in check in infected quarters by constant cleanliness and liberal feeding with easily digested feeds, such as ground hulled oats and buttermilk, but the disease may reappear at any time when the pigs' resistance is lowered. Frequently the infections will disappear from the premises after a few years without discontinuing their use. However, infected quarters are too potent a risk to gamble with, for if the disease does reappear, the expense of medication, the slower gains and the number of runts and deaths can easily cancel more than the profits.

The external parasitic diseases (subgroup III), respond best to different medicinal agents yet in the case of each a very thorough cleansing and disinfecting of the sleeping quarters and rubbing places is essential to complete eradication. Mange is really a serious malady especially in younger pigs. It causes marked unthriftiness and in cold weather is very difficult to check. Once established in a swine herd, it is not easily eradicated.

Of the internal parasitic diseases (subgroup IV), some respond in a measure to certain vermifuges, while others can not be removed by any drugs or treatments. Indeed, few phases of veterinary practice are more discouraging to one who really tries to be thorough, than the elimination of internal parasites. This is more or less true in all species of farm animals. Although vermifuges will always be necessary and an asset to animal health, yet their cost may often be greater than the actual benefits derived from their use.

In swine, the ascaris infestation offers the greatest chance for benefit from vermifuges, yet at best the effects are only fractional and temporary. The injurious ascaris larvae are usually in the liver or lungs, where they are practically beyond the reach of drugs, while the adults, which may be more or less eliminated by treatment, are relatively harmless. Many of them undoubtedly have already evacuated their ova and would soon have passed on without aid. Among others, lung worm, whipworms and thornheaded worms which we occasionally meet are definitely injurious, but there is no known vermifuge which will remove them. There is therefore only one satisfactory solution for the control of internal swine parasites and that is prevention by sanitation, which means isolation from infested animals, in clean, uncontaminated quarters.

When we consider the absence of diseases in swine when first raised on these prairies, the many infections which now appear in long-used hog quarters and the relief afforded when they are abandoned for new uncontaminated quarters, such as in the well-known McLean County system, surely it makes a very strong case for sanitation as an indispensable asset to swine-raising. Then why is such a system not universally used? Why do we still have so much preventable swine disease to contend with? The reasons are many, mostly involving the human element. Shiftlessness or contrariness may always prevent some breeders from complying. Others, before being sufficiently aroused to take any action, must be convinced—first, that a preventable disease is present, second, that the disease can best be eliminated by the measures suggested and, third, that the benefit will be greater than the cost.

Being unable to see the microorganisms responsible for the maladies, the average man is prone to blame the weather, the feed, the presence of any visible parasites, though relatively harmless, or even the zodiac, for his troubles. Time and patience are necessary to teach him of the true cause of his troubles, but

too frequently all your efforts are completely canceled by the advice of some over-wise neighbor or the diagnosis of some remedy salesman.

When finally convinced that preventable infectious conditions do exist, we next must sell him on the value of such an unspectacular remedy as sanitation. In selling sanitation we must overcome, first, the influence of his predecessors, who recognized no such infections and who were able to raise swine successfully perhaps in the very quarters in which he now is having trouble. We occasionally meet a farmer who, like some athletes, actors and others, still believes in superstitions such as keeping a goat in the herd to ward off diseases. Then we must counteract the optimistic promises of the very active swine remedy industry whose advertising and sales talk keep alive in the average man an unbounded faith in the mysterious benefits to be derived from the simple use of any drug, chemical or biologic bearing an impressive name.

If the money spent for such were instead applied wisely for sanitary measures our swine diseases could be greatly reduced. Vermifuges, for instance, in addition to being a very inefficient method of combating swine parasites, are frequently used where very few if any parasites exist. Although much less true now than prior to the depression, many breeders still treat their pigs regularly, thus relieving their conscience, if not the pig. A few postmortems or fecal examinations may stop this oftentimes needless expense. The same is more or less true of many other hog nostrums, tonics and, to a certain extent, even of the mineral mixtures indiscriminately sold by the high-pressure vendors. The men selling these products probably look as intelligent and talk as convincingly as the sanitarian and, furthermore, the salesman has a tangible remedy to apply which, to many persons, seems much more practical than theories about avoiding invisible micro-organisms.

Furthermore, the average reasoning person is often justly confused concerning the mode of disease transmission, because he is told that in some diseases the infection is carried for long distances by insects or by the wind, whereas that others are not transmitted even across a fence. For instance, knowing how hog cholera appears many times, as if spontaneously, regardless of sanitary measures, it is difficult for him to believe that other diseases may not do likewise and frustrate all his efforts. Many also are unable to appreciate why the liberal use of some dip or disinfectant will not sterilize the old buildings and yards. To

him the process of disinfection is often simply a matter of scattering products which create penetrating, disagreeable odors. This is probably a modern version of the ancient battle against the evil spirits with asafetida, which probably is encouraged by modern methods used in fumigating.

Then finally, when convinced that a system of clean quarters is necessary and justified, he may be faced by such practical difficulties as no uncontaminated quarters to which to move, lack of finances to build fences and shelters in clean quarters, no fresh water supply and no pasture crops in the new quarters and, if he is a renter, the opposition of a reactionary landlord.

Any farmer unable or unwilling to switch to clean quarters may be forced in time to reduce his swine-raising to or nearly to the vanishing point. Reducing the number of pigs raised in old lots seems often to reduce the incidence of disease and obviously abandoning swine-raising entirely is the quickest way to stop swine deficits. If, then, the old quarters are thoroughly renovated by the removal of old manure or straw piles and of the temporary sheds and rubbish, and if the mud holes are drained or filled and the shelters cleaned and exposed as much as possible to the sun and weather and the lots properly cultivated, then the infectious agents may too be reduced to or nearly to the vanishing point in a few years.

Obviously the details of a sanitary program must be modified to fit the needs of each farm and farmer. For many the provisions of the McLean County system are adequate. *If* the sows are not carriers of pathogenic infections or parasites and *if* the quarters are actually uncontaminated, and *if* disease carriers are kept out, then the pigs should be free of such infections or infestations until they are returned to the permanent quarters. However, that "if" is often a tragic word. Too many breeders have been disappointed by having these preventable diseases appear in the new quarters after having gone to the trouble and expense of moving.

A chain is never stronger than its weakest link and the weak link here usually is the use of sows which are disease carriers. I recall a case where the entire crop of pigs from six sows died with an acute infectious enteritis when about two or three weeks old, even though they had never been outside of a newly built hog-house. The sows were in excellent condition and were grand mothers, but one of them when closely observed showed the deformed face typical of so-called bull nose. This though apparently healed, was probably the source of the infection.

Another weak link in the McLean County system is that the shoats will be exposed to some of these infections, especially mange and necrotic and hemorrhagic enteritis when returned to the permanent quarters or feed-lots. If they are to follow feeder cattle, then there probably is no choice as to their quarters. However, if the hogs are to be fed alone, as is done on most farms, they can be kept in the clean quarters until ready for market if proper shelter is provided. This is not so difficult or so expensive as it might seem. A straw shed, for instance, when properly built on high or sloping ground by threshing straw onto a pole and wire frame, is one of the finest shelters hogs can have. If the ceiling is low and drafts are checked at the entrance, it will usually be warmer and better ventilated in cold weather, cooler in summer, and as dry and sanitary as the most elaborate and expensive hog-house. The principles of the straw ceiling or loft which often must be built in our fancy, high-roof hog-houses to reduce the annual losses from swine flu and pneumonia are further extended with walls as well as a ceiling of straw.

The water supply, which should be near the shelter is, perhaps the greatest problem in a straw shed due to the necessity of heating the water in cold weather and the resulting fire hazard.

Such a shelter might be used for several years or until it breaks down or diseases appear in it. This might be desirable, especially if connected with an alfalfa pasture. When abandoned, it is easily torn down, the remnants burned and the site plowed, thus removing all contamination.

If pasture can be rotated annually, an ideal system for swine sanitation would consist of three or four small fields of a size to furnish sufficient pasturage for the herd. Each pasture should be fenced hog-tight with water piped to it. A system of crop rotation that would leave one field for pasture each year with some legume mixture such as sweet and red clover for part of the forage crop should be adopted. Unless other equally satisfactory shelter is available a new straw shed would be built each summer when the nurse crop for the legumes was thrashed. In the fall, when the legumes were ready to be pastured, the gilts selected for breeding could be moved into the new quarters. The balance of the herd would be fed out in the old quarters, and then their straw shed would be razed. Thus two such shelters would be provided to avoid crowding as the hogs grew larger. The gilts would have the advantage of the succulent legumes as late in the fall and as early in the spring as any pasture could be available, but the feeders might be short on pasture in the fall.

Is this system a dream? Yes and no. Such a system of rotating pastures for cattle and horses has proven very valuable and adequate in northwest Iowa over a period of twelve years. Straw sheds have always been excellent hog shelters so they could be combined with maximum comfort for the hogs, maximum sanitation and probably maximum profits to the owner. Eventually some such system may be imperative. (Applause)

PRESIDENT SMITH: Dr. Aitken has presented a very interesting paper, and we thank him for it.

The meeting will now recess.

. . . The meeting recessed at 12:20 p. m. . . .

RECESS

THURSDAY AFTERNOON, DECEMBER 2, 1937

The fourth session convened at 1:45 p. m., President R. W. Smith presiding.

PRESIDENT SMITH: This morning we did not complete the program, and we have the report of the Committee on Transmissible Diseases of Swine still to be presented. Dr. C. N. McBryde, chairman of that Committee, will present the report at this time. (Applause)

. . . Dr. McBryde read the report. . . .

REPORT OF THE COMMITTEE ON TRANSMISSIBLE DISEASES OF SWINE

DR. C. N. MCBRYDE, *Chairman*, Ames, Iowa

Dr. F. A. Imler, Kansas City Kan.

Dr. H. J. Shore, Fort Dodge, Iowa

Dr. Chas. Murray, Ames, Iowa

Dr. Mark Welsh, College Park, Md.

Your Committee feels it has been able to obtain from authoritative sources rather accurate information relative to the prevalence of swine diseases in the chief hog-raising states of the Middle West and finds that the diseases of greatest concern to the swine-breeder are, in order of relative importance, hog cholera, enteric disorders and swine erysipelas.

Hog cholera has been more prevalent than it was last year, that is to say, more outbreaks have been reported. However, in consequence of the higher market value of swine, there has been more prophylactic vaccination and this, together with the fact that the pig crop was considerably below normal, has tended to limit the spread of this disease. More post-vaccination trouble has been reported from some areas, which is not surprising, perhaps, in view of the greater amount of prophylactic vaccination. It is believed that such trouble might be eliminated to a large extent through more careful study of herds prior to vaccination and the administration of ample doses of serum.

Enteric diseases have been reported as more prevalent this year. This may be due, in part at least, to the fact that the past summer was much wetter than the preceding one, which was unusually dry. These infections must be regarded as filth-borne and preventable diseases and the only hope for their eradication would seem to lie in the education of the hog-raiser in matters of sanitation and especially through the promotion of the so-called "McLean County System,"

which not only serves to prevent enteric and parasitic diseases, but also tends to eliminate post-vaccination trouble.

There seems to be no question but that swine erysipelas is on the increase and is now becoming a disease of major importance to the swine-breeder. This disease has been fully discussed by one of the speakers on our program, who has collected valuable data regarding its widespread distribution throughout the United States.

Trichina infection in swine is a matter of very great importance because of its bearing on human health. This subject has been authoritatively discussed by another speaker on our program.

A noticeable increase of brucellosis in swine has been reported from certain states. A reliable laboratory test for this disease should facilitate its elimination from swine herds as well as dairy herds.

Respiratory infections have been reported as more prevalent in northwestern Iowa and in Nebraska and what seems to be an unusual or atypical form of influenza has been noted, followed in some instances by heavy losses from pneumonia. It is believed that such losses might be materially reduced through improved housing conditions and better care of swine herds at the approach of and during the winter season.

The frequent movement of swine as a result of the phenomenal growth of so-called "community sales" undoubtedly promotes the spread of infectious diseases peculiar to this class of live stock. The Committee would strongly urge a more rigid supervision by state or other regulatory officials of this increasing traffic in swine to prevent the dissemination of disease and to safeguard purchasers against loss.

It is believed that a great deal may be accomplished in the prevention of swine diseases through the wider dissemination of information relative to improved sanitation and the proper feeding and housing of swine. The Committee would strongly urge that the U. S. Bureau of Animal Industry continue its field project relating to hog cholera and allied diseases. State officials, college and extension veterinarians and specialists in live stock are also urged to promote similar programs or activities and to stress the relationship to human health of certain swine diseases, such as trichinosis, brucellosis and erysipelas.

DR. MCBRYDE (continuing): Mr. President, I move that this report be referred to the Executive Committee.

... The motion was severally seconded, voted upon and carried unanimously. ...

PRESIDENT SMITH: There is one other matter of business that perhaps we should attend to at this time. It has been customary in the past for a Nominating Committee to be appointed to report on the election of officers. What is your pleasure in this matter?

DR. WISNICKY: I move that the President appoint a Nominating Committee, to bring in a slate of officers in nomination for the ensuing year.

DR. W. J. BUTLER: I second the motion.

... The motion was voted upon and carried unanimously. ...

PRESIDENT SMITH: I will appoint that Committee a little later.

Our program has been changed a bit this afternoon. I will announce it now and also a little later, that the paper on "Undulant Fever in Man and Its Relation to Bang's Disease in Live Stock," by Dr. Gaylord W. Anderson, will not be presented. In place, thereof, Dr. A. F. Schalk will read a paper.

The next address to be presented is to be given by a man who needs no introduction to many of us. He is the president of the American

Veterinary Medical Association, and also Dean of the College of Veterinary Medicine at Ohio State University. I refer, of course, to Dr. O. V. Brumley, who will address us at this time on "Veterinary Education and Training for Public Health." Dr. Brumley. (Applause)

. . . Dr. Brumley read his paper. . . .

VETERINARY EDUCATION AND TRAINING FOR PUBLIC HEALTH

By OSCAR V. BRUMLEY, Columbus, Ohio

Dean, College of Veterinary Medicine, Ohio State University

Public health is not a science standing in isolated grandeur. Rather it is a coöperating and coördinating focus, at which meet all of those sciences which may assist in surrounding man with every safeguard which may protect and prolong life.

The twentieth century has seen the most rapid increase in the average span of life of any age in history. The life expectancy in 1900 was 49 years, according to statistics of several registration areas. In 1910, it was 51 years; in 1920, 55 years, and today it is a little better than 58 years. This increase can be contrasted with that occurring between the sixteenth and the eighteenth centuries, when the span of life increased from 21 years in the sixteenth century to 34 at the beginning of the eighteenth. The eighteenth and nineteenth centuries saw an increase of but 13 years.

What, then, has been the cause of this more rapid increase in the average length of life? Many items have to be considered, but among all of these items sanitary science has probably been the one greatest factor in this accomplishment. It has been during this period of the twentieth century that preventive medicine and sanitary science have advanced most rapidly. This educational program which has been such a vital factor in the results just stated has been carried forward by a large number of agencies, so that it has had a very favorable reaction on the entire populace of the country.

The members of the veterinary profession as a group are vitally interested in all programs for the betterment of the health of the public at large. I think it is generally conceded that a public health program cannot be considered adequate or complete unless all agencies capable of contributing to such a program are utilized in carrying it forward for the benefit of the entire citizenship of a community. Furthermore, every group capable of such contribution should work harmoniously with other groups to the end that the public be served more efficiently. None of

the groups now in public health work have a monopoly on the service that can or should be rendered to the citizens of a community or state. There are a variety of ways and means by which a well-rounded and adequate public health program can be carried forward.

We recognize the fact that the medical profession is concerned primarily with the preservation of human lives while the veterinary profession is more concerned with sustaining them. To be more explicit in the latter part of the statement, we mean that the veterinarian's concern relative to the life of the human family is in seeing to it that a wholesome and safe food supply is available at all times to sustain life and protect it from the menace of various diseases transmissible from animals to man. The veterinary profession also recognizes the fact that a high-grade public health service maintained on a lofty plane and sustained by all capable agencies, constitutes the most highly valued earthly institution that any unit of peoples could hope to possess. It is for this reason that the members of this profession are concerned about certain phases of the public health program, especially along the lines of sanitation, a safe and wholesome food supply, and the control of diseases which are transmissible to the human family.

The control of the food supply has been and is now an important factor in this program of disease prevention and protection of public health. Meat, milk and their products have been an important part of the diet of practically the entire population during this period.

It is necessary for the veterinary profession as a unit to become more public health conscious if we are to take our proper place in the whole public health program. By the same token it is important to educate the other professions and the public at large as to the ability and preparedness of the veterinary profession to assist with such a program. In making these statements I do not wish to detract one iota from any of the other services rendered by our profession. These statements are made only for the purpose of emphasizing the importance of considering more definitely at this time this phase of the profession's work—and what kind of education and training is essential in order to meet all the requirements for public health service. We maintain that the education and training of the veterinarian can be and are made sufficiently broad and inclusive to prepare him for efficient service in the field of food hygiene. Let us explain the basic facts relative to such preparedness and the

function of the graduate veterinarian in this program of public health service.

The primary objective in the development of a veterinary curriculum, naturally, is to educate and train individuals for the general practice of veterinary medicine. However, there are several special phases of veterinary medicine which at this time indicate that the student needs special education and training to prepare him properly for that service. It is generally conceded that the majority of the graduates of the colleges in the past have been more interested in the so-called general practice of their chosen profession than in the many other of these special phases which have more recently become such outstanding and important public services. Many of the graduates of today also think in a similar manner. However, there are quite a large number of graduates who are either not adapted to this particular phase of veterinary medicine, or who for selective reasons are more interested in the various public health services rendered by the veterinarian through the veterinary profession. Young men of today who are being selected more carefully on a basis of scholarship, personality, background, and adaptability, for admission to the veterinary colleges will be more capable perhaps during their academic experience of giving more thought and study to the phase of the profession they wish to follow after graduation.

A broad education and training from the point of view of both a cultural and professional curriculum is absolutely essential to prepare the individual to make an intelligent decision in regard to his life's work. It is very important in our judgment to lay the proper foundation in education before trying to build the structure itself. The group interested in the various public health services should be given special attention as undergraduates, so that they may be properly educated and trained to develop and carry on the work efficiently, that the citizens of our country may be protected from the diseases transmissible to man from animal and plant life. In order to become proficient as an administrator in public health work, perhaps some special training as a graduate student along such lines should be considered.

In order to consider a basis for our discussion of the subject, we might inquire, at this point, what constitutes veterinary public health service? Every veterinarian, regardless of the particular phase of the professional work in which he is interested or engaged, is constantly coming in contact with many of the

diseases of plants and animals, which, unless they are controlled, are a real menace to the health of the public. The practitioner of veterinary medicine, therefore, plays an important part in public health service. He may not have in mind the public health phase of his work, nor such services may not be classified as direct public health services, yet in his regular duties as a practitioner he is constantly serving the public as an important cog in the machinery of public health service. Therefore, the practitioner of veterinary medicine should not only prepare himself for this service during his academic training but should constantly be on the alert in his community after graduation to render a coöperative service along public health lines with the other professions and agencies.

Personally, therefore, we look upon the profession of veterinary medicine in any of its phases as having an important part in the whole scheme of protecting the public from diseases transmissible from animals to man. The veterinarian in practice, the research and investigational worker, the federal, state and municipal inspectors and all others, all are constant contributors to the health of the citizens of our country. Therefore, in developing a program of education for public health service, there should be, as indicated before, first of all, a thorough education and training of the student in the fundamentals of a general educational program and cultural courses, followed by a well developed interrelated veterinary curriculum which will properly prepare the student for specialization in the various phases of veterinary medicine in which he may be interested.

In a recent survey, made relative to the organization of departments of health in the various states and in all cities in the United States over 25,000 population and in all cities over 5,000 population in the central states, we find an appalling situation relative to an adequate protection of the public from the point of view of veterinary public health service. We contend that there are certain types of public health services which by training and education can be rendered efficiently only by members of the veterinary profession. Reference is made in the survey of those services coming directly under the state, municipal and county health departments. This survey was made for the purpose of determining a basis upon which a program of education could be started, both academically and to the public at large.

In our opinion the veterinary profession has not given sufficient attention to the education of the public to the importance of its services along public health lines. More attention, of

course, should be given to the proper preparation of the graduate so that he will be better prepared to render such services. Perhaps a more definite specialized educational program by all colleges will be a necessity in the near future. The veterinarian, on account of his background of animal husbandry and scientific knowledge of the diseases of food-producing animals, is the only individual who can render the most efficient type of service in the protection of the public against the transmissible diseases. These statements are made illustrating the fact that education for public health service in veterinary medicine must be and is by most colleges expanded and intensified to meet the real needs in the protection of the health of the citizens of our country. From the point of view of veterinary education relative to public health work in the colleges in the past, it has been relatively weaker than that in the other fields of veterinary medicine but is now greatly expanded and is sufficiently broad so that the graduate can carry on such work efficiently.

If this phase of veterinary education is to be increased further or intensified in the curricula of the colleges, we should show, first of all, why such an increased program should be promulgated; secondly, the present status of veterinary education along this line; thirdly, definite recommendations for the improvement of public health education for the future..

ENLARGED PROGRAM NECESSARY

The close association of man and animals over a period of many years has especially created a definite hazard to both. There are 125,000,000 human beings and 650,000,000 domesticated animals and birds, not considering our wild life, living in the United States at the present time. These numbers are constantly on the increase. Consequently, a greater segregation of the human family and animals will create new problems, more hazards, and a demand for increased knowledge to cope with these problems as they arise. We must always keep in mind the close relationship that exists between man and animals and the many diseases common to both. Also, when we think of the animal kingdom, so-called, we must include not only the domesticated animals but the wild ones as well.

Wild animal life, which has not been given very much consideration in the past as a public health problem in the dissemination of diseases, is now being found to have a very important bearing on the perpetuation and spread of certain infectious and contagious diseases, parasitisms and other conditions. Conse-

quently, all animal and plant life must be taken into consideration in the development of a program of education and preparation for public health service in the future. To many of us it seems inconceivable that the birds and animals in the fields and forests, and the fishes in the lakes and streams should have any bearing on the health of the public, but even a brief survey of the situation has revealed the numerous diseases and parasites affecting many of these species which are transmissible either directly or indirectly to man. Therefore, this is a very large and important field, which at present is only superficially explored, but looms as one of the very significant problems from an educational point of view, primarily from the standpoint of public health education.

Wildlife research stations are now being developed at various points for the purpose of making surveys of the situation surrounding wildlife, their environmental conditions, diseases, etc. Already much information of importance has been accumulated, but it is only the beginning. The veterinary colleges, since they are better equipped in personnel, educational background and equipment to carry on such investigational work along this line, have a distinct and definite obligation to develop this program further, study the diseases of wildlife, and learn what significance such diseases, as are found, may have on a public health program. We are already familiar with numerous species of parasites found in the various species of wildlife. Tularemia of rabbits has proved to be an important public health question, as well as several other diseases. This is a very fruitful field for research.

There is at this time some very definite information relative to a number of diseases of the domesticated animals which are directly transmissible to man. In many of these diseases active steps have been taken to control them and have proved to be successful to a high degree. The Bureau of Animal Industry has rendered a magnificent service in the control of many of these diseases, and in educating the public to their importance from a public health point of view. The contributions made by the Bureau of Animal Industry, both from a regulatory and educational standpoint, have been one of the outstanding achievements in public health work in the United States, and no doubt in the world. It has been clearly shown by surveys made that, wherever the jurisdiction of the Bureau of Animal Industry extends its services, the public is efficiently protected from diseases of animals and animal food products.

However, there still exist many problems from an educational and regulatory standpoint to be developed. This is especially true in a large section of the United States not under federal jurisdiction. Much of the meat, milk and other food products consumed by the public has had absolutely no inspection service and, consequently, a large number of our citizens are menaced by consuming unwholesome and dangerously infective and diseased products. This is largely an educational problem. The education and training of individuals in these local areas to provide adequate inspection service, and the education of the public to the importance of having such protection at all times, represents the real educational problems. In our judgment there must be a program of coöperation with the state, county and municipal organizations in order to build up an adequate educational program to cope with this situation. The public, if they are made conscious of the danger of consuming diseased products, will soon coöperate with the various agencies to correct the situation. This requires real leadership. The local veterinarian can be and is a vital factor in assisting in carrying forward such a program.

The educational agencies can increase their programs along this line, but there is something else needed. We believe that the American Veterinary Medical Association should provide the public education on the value of the efficiency of the veterinary profession to serve the public along these lines. In this respect we feel that our association has been neglectful and should immediately begin a systematic educational program along these lines. There are many human interest stories linking the human subject with the domesticated animals which could be kept before the public in the press. If such a concentrated effort were made to acquaint the public with definite facts relative to the veterinary profession, and what it has accomplished along public health and other lines, and keep constantly at it, it would soon bring to the realization of the public throughout the country the real importance of such programs which are unselfishly perpetuated for their benefit and protection. In our judgment the education of the public to the point of recognizing the value of such a program is equally as important as actually performing the services. This presents, therefore, a dual program of education which should not be left entirely to the colleges, but should combine all of the veterinary agencies in the country to carry it through to a successful conclusion.

Referring again to the transmissible diseases from animals to man, there are many problems yet to be solved, many diseases

whose identities throughout are yet veiled in mystery. The etiology of some of them is unknown. Consequently, their real significance cannot be evaluated until more information is available. In other cases the epidemiology is undetermined. As a matter of fact, there are many problems relating to the various species of animals which need much study before their real significance from a public health point of view can be definitely determined. These problems are a real challenge to our colleges, research departments and to all individuals who are interested in research work, to find their solution. The profession needs more highly trained and educated veterinarians for research work to carry on and solve many of the problems relating to public health service.

Just how much nutritional diseases of animals affect the health of the public may be questioned, but it is generally conceded that this group of animal diseases is receiving much greater attention by our research workers now than formerly. No doubt, as time goes on and more information is obtained, this group of diseases will reveal much that is of value in connection with public health work. The development of glandular extracts and other products from animals which are now of great value in the correction of certain definite diseases in the human family indicates very clearly that this is a productive field from a public health educational standpoint. Many other products of a similar type, no doubt, are a possibility and will crown the efforts of those who are persistent in their investigational work along this line.

We might be classed as visionary in this connection, but we believe seriously that this field offers extremely potent opportunities for those engaged in the educational field and that the revelations along this line are now small indeed to what they will become in the not far distant future. When more is learned and known relative to the exact physiological function of the endocrine and other glands of the animal's body, we will then be in a better position to make the proper application of these various products in the alleviation of many of the functional and other types of conditions in animals and in the human family. Research work along this line should receive much more attention than formerly on account of its public health aspects.

General food inspection is a subject which has been discussed at considerable length by public health officials. By this is meant the inspection of food products not only of animal origin, but practically all foods of a perishable nature that require hygienic

and sanitary control to insure their wholesomeness and safety to the consumer. This naturally involves and includes the inspection of restaurants, hotels, markets, storages, confectionaries, and other food-preparing and dispensing establishments. In our judgment it is impossible to separate the various foods from the standpoint of veterinary inspection, and therefore, from a public health service standpoint.

When serving as a member of the Board of Health of the City of Columbus, I was immediately confronted with certain definite problems. Naturally, meat and meat products, milk and milk products problems were in the foreground, but there was constantly a question arising relative to other foods in the various establishments. We accepted the situation, as there seemed to be no other solution for it. Such inspections presented new problems and required new methods of approach to solve them. Furthermore, a new vocabulary needed to be learned, as well as information from an entirely new source in order to cope efficiently with the situation. Therefore, restaurants, hotels and other depots where foods were used or stored were included in the regular routine of inspection service. The technics of the inspection were modified, *e.g.*, bacterial cultures were obtained from various places and equipment in the hotels and restaurants, such as plates, knives, forks, spoons, glasses, etc. Cultures were also obtained from the waiters' and waitresses' hands. These cultures were then grown and a careful study made of them. This information, with the regular routine inspection conditions, were reported to the management with suitable recommendations.

As a result of such a campaign, many restaurants were ordered closed as being dangerous from the standpoint of the public health. Others made changes in their equipment and personnel. All in all, it has had a very beneficent effect in reducing the hazards of eating in the various establishments. This campaign served as a source of much material from an educational standpoint which has been used for instruction of students and other educational work. Some may disagree with the statements just made, but I do not believe it is possible to separate general food inspection from those which ordinarily are included. There is much to be developed educationally along this line. General food inspection requires much technical and practical knowledge in order to be efficient in its practical application.

There are, of course, many other problems which naturally arise out of this whole question of public health service, but we

appreciate fully the whole question from an educational standpoint and hope that you, as members of the veterinary profession, regardless of the phase of the work in which you may be engaged, will become public health service conscious and will promote this service in your community.

PRESENT STATUS OF VETERINARY EDUCATION

All of the various veterinary colleges, recognize the importance of certain types of public health education. This is true of meat inspection, which is given as a separate and distinct course or courses by all the veterinary colleges. The length of time devoted to this subject is perhaps inadequate, and insufficient time given to practical work, but on the whole it is recognized, and an honest, conscientious effort is being made to give some actual experience in nearby abattoirs in coöperation with official inspectors-in-charge. More of the application of the fundamental principles, obtained in other college work along with such a course, will naturally give the student a much broader knowledge of the subject, which will be most valuable to him regardless of the phase of the work he may choose to enter after graduation.

Some of the colleges are now offering a practical course in meat-cutting, so that the student will be more familiar with the various cuts of meat and the division of carcasses. This is in our opinion quite important to any one who will engage in meat inspection, especially markets.

Milk inspection or dairy technology is given in a much more extended form than a few years ago. It now includes much information relative to milk and milk products, all of the various tests for milk adulterants, the chemistry of milk, and milk and dairy inspection. A very comprehensive study is now being made by the student in most colleges along this line, especially in connection with the bacteriology of milk and physical examination of animals, and in many practical ways he is learning to apply these principles in dairy herds. This phase of public health educational work has been greatly expanded by the colleges and the students now being graduated should have both a well-grounded theoretical and a practical knowledge of the subject. Milk and its products, being such a vital part of the diet of American people, make this phase of the educational program for public health service a very prominent one to protect the public from the many milk-borne diseases and other factors leading to its unwholesomeness.

General food inspection and hygiene is now being offered by some of the veterinary colleges at the present time and, no doubt,

will be extended as time goes on. The importance connected with this subject is largely a practical application of the fundamental principles learned in the various other courses. We believe that a student who is graduated from one of the various veterinary colleges at the present time has a very good conception of all these public health subjects and problems. Perhaps in the near future more time can be devoted to the practical aspect of this subject and greater facilities will be made available for practical instructional purposes. As was stated in the beginning of this brief discussion, the entire course in veterinary medicine contributes very materially toward the education of the student along public health lines.

There can be no question, but that some specialization in public health education will be the future requirement for those who are to have charge of this specialized service. The expansion of the public health program, which seems to be inevitable and developing rapidly, will require a much increased personnel. Just how the expansion in personnel is to take place is a much debated question at this time. We are convinced that certain phases of public health work can best be performed by the trained and educated veterinarian. However, the number being graduated from the colleges at this time will not permit of much expansion in this direction. It behooves the profession in this country to think seriously along this line and to cooperate fully to the end that the veterinarian will retain his rightful place in the public health service.

In considering the educational programs that are being carried on at the present time, we should not fail to mention again the fine work being conducted by the Bureau of Animal Industry along this line.

The Veterinary Corps of the United States Army also has developed a highly technical and specialized public health service in that particular area. However, it is reaching far beyond the Army service into numerous communities in this country. This service naturally is primarily concerned with the military service, but after all it has an equally important public health aspect.

There are many other agencies that are doing a fine service both in education of the public and individuals for public health service. However, from the standpoint of the veterinary profession, the veterinary colleges must assume the greater share of the responsibility for the education and training of individuals. The success of the various agencies in carrying on public health services depends very largely upon the fundamental

training of those who enter them. Consequently, the colleges must be on the alert to adjust their curricula to meet the new and increased demands. The colleges of veterinary medicine should cooperate with the other colleges in their institutions to promote postgraduate courses in public health work. This is quite an important matter at this time, in order properly to educate and train graduates to assume leadership in this specialized field.

RECOMMENDATIONS

Recommendations for the expansion and improvement of public health education for the future:

As was just stated, the veterinary colleges are largely responsible for the education and training of those who are to carry on the public health work for the veterinary profession in the future. Consequently, recommendations as they affect veterinary education should be given first consideration.

(a) Preliminary education or pre-veterinary education should be adequate for a basis for a correct understanding of the professional courses. This has been one of the unfortunate handicaps of the profession in the past, a condition which could not be changed on account of the lack of interest by the young men in entering veterinary medicine. However, we believe present conditions will prevail in the future, so that in addition to the year of college work, two years should be required in the near future. The large number of applicants for admission to the colleges, many of whom have college degrees, indicate that this requirement can soon be put into practice. Sometime in the not distant future the requirements for admission can be similar to those of medicine.

(b) The large number of students applying for admission to the colleges, many of whom are not accepted, indicates a serious problem in veterinary education in the near future. There is no doubt but what the colleges are accepting all that their personnel and facilities will permit. Whether increased personnel and facilities for the colleges, which would permit of an increased enrollment of students, is the answer is difficult to say. It is a question which might be difficult to solve for the future. We do know that at present there seems to be an inadequate number of graduates to supply all communities and agencies desiring veterinary service. I particularly would like to recommend a division of the states into definite areas for each of the colleges to serve and a request from states where there are no veterinary colleges to grant scholarships to those

who wish to obtain their veterinary education outside of their own state. This would have an important effect of preventing a breakdown in the veterinary educational requirements.

(c) A thorough study should be made of curricula with frequent revisions so that adequate education and training, both theoretical and practical, can be given in the important public health courses, especially meat, milk and food hygiene.

(d) Develop a curriculum leading to the degree of Doctor of Public Health. More graduates in veterinary medicine should be encouraged to continue their education along this line in order to prepare themselves to become outstanding leaders in public health work. Although the present graduate in veterinary medicine is thoroughly capable of carrying on certain types of service, yet for real leadership in all phases of public health work an extended graduate program is essential. More young men are needed to become interested in this important service.

(e) There are certain courses in hygiene and sanitation at present offered in a few institutions of an abbreviated form which might be of value to the graduate veterinarian, but entirely inadequate to the individual who has no particular professional training or education and who desires to serve in the capacity of a public health expert. In any event, such services should be under the direct supervision of those having the proper professional background in education and training for them to be carried on in an efficient manner.

(f) Local practitioners of veterinary medicine should make surveys of their local public health situations. Does your community have adequate public health service? If not, help to bring about a better status by lending your support educationally and in every way to better the situation to make a more healthful community for all. You can work with the local physicians, dentists, and others interested in such programs. They will welcome your help.

(g) I wish to recommend at this time a very definite policy of public education relating not only to a veterinary public health program for the benefit of the health of the public direct, but also to the health of the live stock industry and its promotion. It is conceded by all that the live stock industry is indispensable to the well-being and happiness of the citizens of our country. Such a program would be of inestimable value to the veterinary profession in all its various phases. Furthermore, this program should be promulgated and carried forward by the American Veterinary Medical Association. It should be initiated

in the central office and radiated to the various state associations and other agencies to assist in carrying forward a definite systematic program. Should this be carried forward to an interesting and human manner, it should bring excellent and lasting results.

(h) There should be a closer coöperation and affiliation with the members of the medical and dental professions. These three professions should be coöperating fully in order to have a well-rounded-out public health program. Evidence of this being done in certain local communities indicates that it can and should be done on a much broader basis. Here again we believe our national association should definitely contact the association leaders in medicine and dentistry for the promotion of a program of public health work throughout the country. Naturally this will require tact and persistency, but we believe it is well worthwhile and can be done.

(i) Let us not forget the possibilities of a wildlife research program and its relation to a well organized public health organization in the control of the transmissible diseases. As was stated previously, sufficient information is already available to show conclusively the importance of the diseases of wildlife in such a program. Further studies, no doubt, will reveal more diseases of the various species of wild animals which will be factors in promoting better health to the citizens of our country. Every state in the union should promote an educational program along this line. Local veterinarians should also think of this problem in connection with their community work and interest.

(j) We are firmly convinced that the education and training of the graduate veterinarian makes him thoroughly capable of carrying on his legitimate field of public health service, viz., food hygiene, and control of transmissible diseases in a highly efficient manner.

(k) Every effort should be put forth during the next few months by the veterinary profession to have proper recognition for and take a definite part in the federal public health program. We believe this can be done by an aggressive organization to present the facts relative to the ability and preparedness of the veterinarian for such service.

In conclusion, I wish to say that preparation for public health service involves a great many factors and many angles are to be considered. The work of public health is so broad and inclusive that no one profession can master all the problems. The veterinary profession has a very definite place in the program and we should recognize that other professions and

agencies have theirs also. Consequently, we should accept our part of the responsibility for the promotion of a public health program and coöperate fully with all others interested in the same thing for better health and a happier citizenship for the entire country.

PRESIDENT SMITH: Thank you very much, Dr. Brumley.

Dr. A. F. Schalk, Professor of Preventive Veterinary Medicine, Ohio State University, Columbus, Ohio, will present a paper on "The Province and Status of the Veterinarian in the Public Health Program."

(Applause)

DR. SCHALK: Mr. Chairman and gentlemen, I don't want you to draw any conclusions that the previous speaker and this paper are going to be as conflicting as they may sound in the beginning. You know, we work in the same institution, and while the program which the previous speaker has laid before you is more general, more comprehensive and more far-seeing, this paper has been prepared for one specific purpose, and that is that according to the title, "The Province and Status of the Veterinarian in the Public Health Program," it refers to the national public health program, the Social Security Act. We are going to overlap upon one or two phases of this problem, and there is going to be a little difference; but in the end I think you will realize that we are working towards the same end.

. . . Dr. Schalk then read his paper. . . .

THE PROVINCE AND STATUS OF THE VETERINARIAN IN THE PUBLIC HEALTH PROGRAM

By A. F. SCHALK, *Columbus, Ohio*

Professor of Preventive Veterinary Medicine, Ohio State University

Milk and meat are basic foods in the rations of the human family. Wholesome milk and milk products and meat and meat products from sound healthy animals are as essential and fundamental to a modern public health program as is the very basic law that created public health. They form the background and represent the very building-stones of an enduring and efficient public health service.

As a profession I think we readily acknowledge and fully recognize public health as being, primarily, a medical institution. However, within that institution we further contend that there is a rather definite field of service that legitimately belongs to and can be rendered most efficiently by the veterinary profession. Hardly anyone with even only a rudimentary conception of food hygiene will attempt to argue intelligently against the incontrovertible fact that the veterinarian of today is indisputably the best trained and qualified agency we have to pass judgment

upon the health of food animals and the wholesomeness of the various food products emanating therefrom.

Yet, in lieu of these facts, in the course of quite recent times and events, there is apparently developing a rather definite trend toward a willful and utter disregard for the veterinarian in this field of work. We specifically refer to the public health program of the national Social Security Act as it is said to be in the making. We are advised that the setup of this program at this time gives no definite status, whatsoever, to the veterinarian, either expressed, inferred, or implied.

That means that we have practically nothing in this extensive sanitary program, the major portion of which is supplied by food animals, the health of which and the wholesomeness of their many food products are guarded and determined by our profession. These, gentlemen, are the cold, hard facts that bring us abruptly to the urgent problem that is upon us.

What are we, as a profession, going to do about it? At this juncture of the tentative program we are decidedly out of the picture, and we will be definitely out if some determined, concerted effort is not made, forthwith, on our part materially to change the viewpoint of those entrusted with the authority to make the final draft of that program.

Whether or not he is aware of the fact, every veterinarian in active service in the land is more or less a public health servant. Regardless of what phase of veterinary medicine he represents, he is either directly or indirectly involved in public health work. His field of endeavor may not be designated as such, and he may not receive any direct remuneration for his oftentimes unheralded efforts, but, nevertheless, he is enrolled, though perhaps unconsciously, in the cause of human health. This being true, it renders our problem at hand a problem common to all—every graduate veterinarian in the United States that is pursuing some phase of veterinary medicine.

We firmly believe that practically all of our fellow veterinarians will subscribe to the statement that one of the greatest, if not the greatest, undeveloped fields in veterinary medicine is that of legitimate veterinary service in public health. The term undeveloped is used here in the sense that this service has not been definitely established in the program; it has not been fully recognized by those who administer public health, or, again referring to our original thesis, the veterinarian has not been given definite status in the program.

While there are many items of major import in connection with this subject in its more comprehensive scope that could

and perhaps should be discussed, at this time, we shall, of necessity, confine our remarks chiefly to certain aspects of the greater problem which we consider most timely and urgent and have bearing upon the immediate question.

Firstly, it has oftentimes been suggested during recent years, both from within and without our profession, that the veterinary colleges should give special courses to students in food hygiene for more specific training for public health service. It has been indicated that the present academic curricula be enriched by additional courses that would serve better to equip our students for more efficient work in food hygiene in public health; that it would be advisable to project a special course of study leading to a special degree; and lastly, that curricula and the necessary facilities be set up for graduate students for higher degrees in this field.

All this appears to be quite plausible and praiseworthy, or rather, it did appear to be such until now. Many from among our ranks, who are greatly concerned and responsible for the education of the veterinarian of the future, readily subscribed to this idea and some actually advocated that the colleges adopt a policy along these lines. However, the recent change in affairs as determined by the activities of the Public Health Committee of the national Social Security Act materially changes the scene and viewpoint of many on this subject.

For the sake of frank discussion, let us set up a hypothetical situation in which all of the foregoing curricular facilities were cataloged and made available to the academic student and the graduate veterinarian. What would be the probable course and outcome under prevailing conditions? At the outset, it is presumed that the average person contemplating specialized fields of study has previously given the subject considerable thought, and, in the course of which, two inevitable questions are almost certain to assert themselves, *viz.*, "What will be my status in said field of work?" and "What is the expectant remuneration for my services therein?"

In seeking to obtain the greatest possible enlightenment as to these inquiries, in all likelihood, he will appeal to the college dean and his associates who are responsible for the curriculum and offer the courses. And, what are we going to tell him? While I cannot speak for my associates in this matter, I want to say that I, personally, would not have face to recommend or encourage in any way such inquirers to pursue such special courses with the idea of making that field their life work under the present outlook.

If we are correctly informed as to the trend this program is taking and the probable text of the code in its final consummation, there are no really worthwhile inducements for progressive students to prepare for and enter this field of endeavor. Upon the face of it, it practically resolves itself into a competitive field in which the so-called sanitary engineer is the chief contender.

Inasmuch as some special sanitary engineering courses cover but three months of study and as there does not appear to be any special requirement for entrance, and as almost any Tom, Dick or Harry without any specified scientific or cultural background or attainments can matriculate for these courses, it causes one to look upon the movement as one that savors of a superficiality in training and capability that falls so very, very short of our requirements and ideals for efficient sanitary training for food hygiene service.

Such mediocrity in background, capability and training naturally precludes anything but a low salary scale sooner or later. This may not be entirely objectionable to the sanitary engineer, as a salary of \$1,200 to \$1,500 per year is probably more than many of them ever made or could hope to earn in other fields.

But, how about the veterinarian? Today, and for the past few years, practically every phase of veterinary medicine that carries salary positions is far more remunerative. The B.A.I., the C.C.C., the Army and most teaching and experiment station positions, with due provision for graduate study, all are paying practically \$2,000 or more per annum, or the equivalent thereof, to graduates just emerging from college.

To express it but mildly, the outlook and prospect is exceedingly dark and discouraging in view of existing conditions. The student can ill afford to prepare himself specifically for such indefinite work and the college officials and instructional forces will hesitate to catalog additional special courses in a field of work that now appears so speculative and holds out so little in encouragement for the future. It certainly looks like a rather poor risk to both sides. However, if we succeed in getting the veterinarian's status secured in the public health program, the remuneration or salary item will within a very brief time take care of itself. In this way, public health officials will be compelled to compete with other veterinary agencies and institutions as regards salary scales, in order to secure competent men.

We have dwelt with considerable detail with the question of advisability of the veterinary colleges enriching their curricula with additional courses leading to special and higher degrees in

public health. Now let us discuss briefly just what the colleges are already doing in the way of academic training to that end.

It is quite possible that public health officials and many veterinarians who were graduated just a few years back are not fully informed as to just what the present-day curricula have in stock for the student. The criticism is too often made that the colleges are doing practically nothing toward preparing the student for public health service. One who is on the inside can hardly subscribe to that unjust criticism. Factually speaking, there are a great number of regularly projected courses in the undergraduate curricula that contain many items of fundamental significance that serve as the ground-work for both general and special sanitation which find ready, practicable application in any up-to-date health program.

Aside from the several courses offered that pertain to general bacteriological technic, special pathogenic bacteria and immunology, including the various serological methods and technics, most colleges give their upper classmen practical experience in bacteriological, pathological, immunological and parasitological problems in their clinical and diagnostic laboratories.

Chemical training has been greatly enhanced and simplified for fuller interpretation and ready application, and physiological chemistry no longer remains the abstract course it was formerly. The dairy technology courses of today for veterinary students, in most colleges, are a revelation as compared to those offered just a few years back. The student is generously exposed to class-room discussions and demonstrations and laboratory exercises and tests that practically cover the entire field of milk in the normal and processed states, as well as its many various adulterations and pathologic aspects.

The meat inspection instruction is not only greatly extended in a didactic way, but in most institutions is supplemented with practicable training in neighboring packing establishments under the guidance of capable and practical veterinary inspection.

Lastly, some institutions have a required food hygiene course. Here the students are required to work up and correlate the various major phases of food hygiene as the veterinarian sees and meets them in actual food inspection work. Much more could be mentioned as regards the present-day student's training for this field, but we believe this suffices to show that the criticism, that "nothing is being done by the colleges for public health training," is certainly ill founded. After fully considering the subject in its entirety, one must raise the question, "Is

the probable compensation to be derived by the veterinarian, from a field of work in which he has practically no status, commensurable with the whole effort by student and faculty in securing the training." Many are beginning to think seriously upon this very matter.

Finally, returning to the apparent, more acute phase of our problem, we raise the question, "Are we entirely certain that our cause has been fully presented and judiciously pleaded before the proper authorities who have final jurisdiction in this case?"

At this time we want to commend highly the Minnesota State Veterinary Medical Society for the timely action taken by that organization last January. For the benefit of those who are not familiar with this movement, we will briefly explain. At their winter meeting, they drew up appropriate resolutions, duly protesting the idea of slighting the veterinarian in the national health program. Copies of these resolutions were forwarded to the Secretary-Editor of the A. V. M. A. and to the various state veterinary associations, with requests that the latter draw up similar protests and in turn forward copies of them to the Health Commission at Washington.

This was a noble gesture on their part, but we learn with deep regret that the response was far from being unanimous and that only a relatively few fragmentary resolutions reached the Commission.

We candidly think that this movement should be revived and laid before every veterinary organization in the land with specific requests to act. In order to insure definite action in the matter, it is earnestly suggested that this organization or the A. V. M. A. specifically delegate some one capable man who will vigorously carry on this most timely extension work.

In addition we would further recommend that an influential committee be appointed consisting of the President of this Association, the President of the A. V. M. A., the Chief of the Bureau of Animal Industry, and possibly one or two other veterinarians thoroughly conversant with the problem, to lay our cause before the Commission. This committee could cordially ask for a hearing with the Commission and, if granted, they would have ample opportunity fully to present the facts in the case for their further deliberation. It is quite possible that all members of the Commission have not, as yet, heard the entire story and thereby are not fully cognizant as to the true relationship of proper live stock sanitation as pertains to food ani-

mals and their various food products and a truly efficient public health service.

If we are correctly informed, the national committee assigned to working out this program expects to complete the final draft of the code sometime about April 1, 1938. Therefore, if the veterinarian is to have a specific place in that program, it remains for our profession to see that it is done before that date. There remain but four months between now and April 1. That is a comparatively short period of time in which to attempt to carry on a campaign of such magnitude. Nevertheless, it is sufficient time if prompt, vigorous action is taken.

Failure to obtain recognition in the national program at this time not only means temporary signal defeat for our cause, but it signifies immeasurable lost ground that may require years, yes, possibly decades, to recover. Once the national code is drafted and launched, its salient features will be more or less inflicted upon every public health program in the land—state, county and municipal organizations. It appears as though it is not entirely improbable that some veterinarians, now holding responsible positions in the various health departments, will, in time, be cast aside and replaced by the so-called sanitary engineers who are now being featured and given prominence in the tentative plan.

It seems as though we have but two alternatives before us, *viz.*, takes the *laissez faire* course, *i.e.*, remain passive and let the situation drift along uninterrupted and unchallenged; or, take hold of the problem with a firm, vigorous hand and tenaciously contest the matter to the very end that we may obtain our just rights and equity in this work.

To stand idly by and just hope and wish rarely ever results favorably in matters of this kind, whereas, determined, consistent efforts, at this time, may establish for us a definite, legitimate status which we candidly think rightfully belongs to our profession in the domain of public health. If in the end we should fail, may we not find at least some consolation in the old adage, that "A good fight fought, for a just cause, though lost, is better than not to have fought at all." (Applause)

PRESIDENT SMITH: Thank you, Dr. Schalk. Are there any questions? If not, we will proceed.

We have another report, and if Dr. Hisel is in the room and is ready to give us the Report of the Auditing Committee, we will receive it at this time in order to expedite matters.

. . . Dr. Hisel read the report. . . .

REPORT OF THE AUDITING COMMITTEE

DR. C. C. HISEL, *Chairman*, Oklahoma City, Okla.

DR. C. U. DUCKWORTH, Sacramento, Cal. DR. F. A. ZIMMER, Columbus, O.

We, your special committee, appointed to audit the accounts of the Secretary-Treasurer of the United States Live Stock Sanitary Association, beg to advise that our duties have been performed and that we find all accounts and statements to be correct as well as being kept in splendid form.

The Committee desires to extend its congratulations to our worthy Secretary.

DR. HISEL (continuing): I move the adoption of the report.

. . . The motion was severally seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: Now we will listen to the report of the Committee on Meat and Milk Hygiene, by Dr. Schalk.

REPORT OF THE COMMITTEE ON MEAT AND MILK HYGIENE

DR. SCHALK: Just a statement or two regarding the one recommendation I made in my paper. Dr. Brumley told you that the A.V.M.A. has already selected a special committee to carry on that work, and we feel as though great progress has already been made. That committee is already organized.

Mr. Chairman, we do not have a special report. Four members of the Committee on Meat and Milk Hygiene of the U. S. Live Stock Sanitary Association, are members of the Special Committee on Food Hygiene of the American Veterinary Medical Association. The latter Committee prepared a rather elaborate report which was presented at the recent meeting in Omaha, and we did not feel that in the course of just a few months, we had very much additional to offer, although differences of opinion develop a short time after reports are made, and a few things that I said in my paper today will conflict a little with statements in the A.V.M.A. report. Otherwise, our Committee is recommending that the A.V.M.A. report be accepted as the report of the Committee on Meat and Milk Hygiene of the Association. You will find the report of the A.V.M.A. Special Committee on Food Hygiene in the October, 1937, issue of the JOURNAL of the A.V.M.A. (New Series, Volume 44, pages 451-458).

We are asking you to read that report if you have the time. A good deal of time has been put on it, and we did not feel as though we could materially improve upon it at this time.

DR. C. U. DUCKWORTH: As a member of the Committee of which Dr. Schalk is chairman, I would like to voice a little thought from the experience we have had. I am inclined to think that the salary committee which you mentioned in your address could very well be coupled up with the Committee on Meat and Milk Hygiene, for the reason, as brought out by both Dr. Brumley and Dr. Schalk, that the remuneration you have to offer a man at the present time is one that will greatly decide whether or not he is going to engage in the phase of veterinary work that has to do with public health.

Some time ago, we found that we could not supply our demand for meat inspectors, and at that time we had a salary of \$170.00 which

went only to \$200.00. We were giving examinations right along, and we pointed out to our Civil Service Commission that in all probability that was the reason why we could not supply the demand. We were unable to get a very good sized increase, but we did get a readjustment from \$185.00 to \$215.00.

We still were unable to supply the demand that we had for men in meat inspection. Then we pointed out to the Civil Service Commission that we were asking for examinations for meat inspectors more frequently than any of the examinations which were being held and which were being conducted in any branch of the state government.

Then it was pointed out that, at that time, the entrance salary was still higher than the entrance salary to Bureau men who were working in the state of California, and we butted our heads against that basic Bureau salary.

However, we were able to demonstrate that, despite the fact that the salary increase was granted, we were still unable to supply men, so we have made another salary revision which has been accepted favorably by the Executive Personnel Officer and presumably it is to be acted upon in January by the Personnel Board, wherein we class our veterinary live stock inspectors, who are doing general field work, and the veterinary meat inspectors, in one group, with a salary range of from \$215.00 to \$275.00.

We have above that what we call a supervising veterinary meat inspector and a supervising veterinary live stock inspector, whose salary range we have requested to run from \$275.00 to \$335.00. Above that range come the men strictly in administrative work in the Department.

We feel that if we can put that over we will have made at least a much greater inducement for men to go into this type of work that is offered at the present time. We are doing everything we can to put that over, and we hope we can do it.

We think that, if such could be done, it might offer a way for other states to follow in getting what we think is a more reasonable salary for a professional man. One of the reasons we were able to bring that about, rather than basing the thing on a comparable work in another regulatory service, was the fact that butchers in slaughter-houses were making more than the inspectors. I think that helped us more than any comparative figures that we could present to the Board.

With that in mind, I sort of grinned and said, "Well, I guess a man with a college education and a college degree ought to be worth as much as a butcher."

We are hoping, on the same basis, that we will have an increase along the lines I have mentioned. But I think that an offer of worthwhile remuneration, whereby a man can clothe himself, his wife and family, and live in a little better circumstances than a laborer, will offer inducement for young men of ability to go into this branch of the work. (Applause)

PRESIDENT SMITH: Is there any other discussion? What do you wish to do with the report of the Committee on Meat and Milk Hygiene?

DR. HISEL: I move it be adopted and referred to the Executive Committee.

. . . The motion was severally seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: On the Nominating Committee I shall appoint the following:

Dr. E. T. Faulder, of New York; Dr. A. C. Topmiller, of Tennessee, and Dr. H. M. O'Rear, of Washington, D. C.

The Chair will entertain a motion to adjourn.

Dr. HISEL: I move we adjourn.

. . . The motion was severally seconded, voted upon and carried unanimously, and the session adjourned at 3:15 p. m. . . .

ADJOURNMENT

FRIDAY MORNING, DECEMBER 3, 1937

The fifth session convened at 9:30 a. m., President R. W. Smith, presiding.

PRESIDENT SMITH: Gentlemen, after I introduce the first speaker, with your permission I shall turn the gavel over to Dr. Westmoraland, our First Vice-President. I have a very close friend whom I am informed is very ill in one of the hospitals here in the city, and if I am to see him at all, they tell me, I must see him this morning. I am going to beg off and endeavor to visit my friend. I shall be back before you adjourn for lunch.

The first paper is "Differential Diagnosis of Respiratory Diseases of Poultry," by Dr. F. R. Beaudette, of the New Jersey Agricultural Experiment Station, New Brunswick, New Jersey. (Applause)

. . . Dr. Beaudette presented his paper. . . .

DIFFERENTIAL DIAGNOSIS OF RESPIRATORY DISEASES OF POULTRY*

By F. R. BEAUDETTE, *New Brunswick, N. J.*
New Jersey Agricultural Experiment Station

Diseases that produce changes in the eye, sinus and nasal cavity or lesions in the trachea and lungs associated with respiratory symptoms are sometimes difficult to diagnose. This is particularly true of birds presented for laboratory diagnosis.

DIAGNOSIS BY POSTMORTEM FINDINGS

A postmortem examination will sometimes reveal sufficient changes to warrant a positive diagnosis. Thus, the findings of nodules in the esophagus of a bird showing white caseous material in the conjunctival sac is adequate proof that the eye lesions were caused by vitamin-A deficiency and not by an infection. Although of rare occurrence now, the gapeworm, *Syngamus trachea*, causes gasping symptoms in chickens and pheasants, and is easily put in evidence by postmortem examination. Likewise, a postmortem examination is sufficient to establish that air-sac mites, *Cytodites nudus*, in the trachea are responsible for mild respiratory symptoms that might otherwise suggest laryngotracheitis, bronchitis or coryza.

*Journal Series paper of the New Jersey Agricultural Experiment Station, Department of Poultry Husbandry.

Arrhythmic gasping not associated with exudation is suggestive of neurolymphomatosis of the vagus, and the visibly infiltrated nerve found on autopsy clinches the diagnosis. In the same manner tumors may be found on autopsy.

In still other instances typical cases of respiratory infections may be correctly diagnosed from the autopsy findings. Gasping symptoms in chicks suggest bronchitis, pullorum disease or aspergillosis. If the autopsy shows caseous nodules in the lungs, on the heart, or in the wall of the gizzard, a diagnosis of pullorum disease can be made and later confirmed by isolation and identification of the organism. Nodules do not occur on the heart or in the gizzard wall in aspergillosis, but lung lesions may resemble those of pullorum disease. Bronchitis in chicks may be suspected when plugs of exudate or mucus are found in the bronchi and especially if the air-sacs are turbid or contain caseous material. The finding of blood or bloodstained mucus in the trachea, or an easily detached caseous plug in the larynx, or a croupous membrane in the trachea, is sufficient to justify a diagnosis of laryngotracheitis.

DIAGNOSIS BY BACTERIOLOGICAL METHODS

As already indicated, suspicious cases of pullorum disease or aspergillosis should be confirmed by isolation and identification of the organism. In suspected pullorum infection, cultures may be taken from the liver or directly from the lung nodules, but in suspected aspergillosis, cultures should be taken directly from the lesion.

Caseous exudates in the eye, nasal cavity, or sinus suggest localized cholera or streptococcus infection. There is also a nasal discharge in bacillary coryza as well as mild gasping symptoms at the onset of the latter disease. These three diseases require a bacteriological examination. A sterile swab introduced into the affected part is swabbed on hemolyzed-chicken-blood agar, and on a whole blood-agar plate which is to be sealed with modeling clay.¹ Suspicious cholera colonies can be picked from the hemolyzed-blood-agar plate and their fermentation reactions determined.² The rather rare hemolytic streptococcus³ can be picked from the whole-blood-agar plate, which, by virtue of the sealing, also supports growth of the coryza bacillus.

With respect to this latter, it must be noted that there is still some disagreement among investigators as to the nature of the disease or diseases classed as coryza. De Blicke,⁴ of Holland, was the first to associate a coryza disease with a specific organ-

ism. This organism, which he called *Bacillus haemoglobinophilus coryza gallinarum*, was isolated from nasal exudate on blood-agar plates. It is described as a short, Gram-negative, non-motile, non-spore-forming bacillus which shows a high degree of pleomorphism. Intranasal injections regularly induced a coryza. A clinically similar disease has been described in this country by Beaudette and Hudson,⁵ Nelson,¹ Delaplane, Stuart and Bunyea,⁶ Lewis and Mueller,⁷ Eliot and Lewis,⁸ and Pistor, Hoffman and Beach.⁹ Most of these investigators have isolated a bacillus similar to that first described by de Blicke. Nelson¹ first obtained it by differential filtration through a Berkefeld V candle, and growth in fluid horse-blood at the base of slanted nutrient agar. The filtrate was innocuous, but after four days in the above medium it would produce a coryza. The organism would not colonize on open blood-agar plates but did when these were sealed with modeling clay. Eliot and Lewis grew their organisms on open blood-agar slants or plates and Schalm and Beach¹⁰ claim that the organism requires both X and V factors for growth and therefore may be assigned to the genus *Hemophilus*. Although agreeing that de Blicke's lengthy name of the organism is descriptive, they favor the binomial *Hemophilus gallinarum* proposed by Eliot and Lewis. Schalm and Beach incubated their cultures in an atmosphere of 10 per cent carbon dioxide. More recently, Kessens¹¹ has studied the growth requirements of de Blicke's bacillus, *Haemophilus coryzae*, and found that optimum growth takes place on chocolate agar made by adding 100 cc of warmed and defibrinated horse-blood to 200 cc of 2 per cent agar liquified and cooled to 65° C. After careful mixing, the ingredients were heated for ten minutes at 65° C. and then placed in tubes or plates. Better growth was obtained in sealed containers. Kessens does not agree with the American investigators on the growth requirements of this organism, in that he found the X factor not needed. Instead, however, he presents data to show that the V factor and a C(oryza) factor are essential. This C factor is described as being heat-labile and is found in blood-cells, potato and fowl serum. Of the liquid media, 10 per cent blood-broth proved suitable for *H. coryzae*.

Thus, it is yet to be established definitely that the organisms isolated in this country are identical with that described originally by de Blicke, but in all probability they are. At any rate, it is generally agreed that whole-chicken-blood-agar plates sealed with modeling clay will support the growth of a coryza bacillus.

Very early, however, Nelson¹ described three types of coryza: coryza I, with a short incubation period and short course; coryza II, with a long incubation period and a prolonged course, and coryza III, with a short incubation period and long course. And, while a second infectious agent was not originally considered, nevertheless Nelson failed to recover the coryza bacillus from cases showing a long incubation period and a long course. These cases had been produced by the inoculation of exudate. But with repeated transfer, the incubation period, but not the course, was reduced and then the bacillus was isolated. In a later publication, Nelson¹² reported the continued propagation of two types of coryza of slow and rapid onset, respectively, without appreciable changes in the characteristics of either. The duration of both coryzas was prolonged. At this time it was reported that the coryza bacillus was associated only with the coryza of rapid onset, and that Gram-negative coccobacilliform bodies are regularly found in nasal exudate of coryza of slow onset. These bodies are described as being $0.5\ \mu$ in diameter, predominantly extracellular, non-filtrable through Berkefeld V candles impermeable to *H. gallinarum*, and fail to grow on artificial media.

In a final publication, Nelson¹³ reported on successful cultivation of these bodies in the fetal membranes of four-day-old eggs and in tissue cultures. Growth, however, does not seem to depend on the presence of living cells. Moreover, fetal membranes and tissue culture suspensions are reported as infective for normal fowl. It is to be noted, however, that in birds inoculated with coccobacilliform-body-bearing material the incidence of apparent disease is decreased.

Nelson's findings with respect to the coccobacilliform bodies are yet to be confirmed, yet it is true that Kessens also has failed to recover the coryza bacillus except in cases with a short incubation period. Consequently, it appears likely that there are two distinct types of coryza, the one type with a short incubation period, from which a Gram-negative bacillus can be recovered, and another type of slow onset associated with coccobacilliform bodies. Since these latter bodies are not cultivable on artificial media, a diagnosis of this infection must depend on (1) microscopic demonstration of their presence in the suborbital sinus, (2) cultivation of the bodies in tissue culture, or in very young embryonated eggs (four days old), or (3) on clinical grounds that an exudate produces a coryza only after a long incubation period and from which the coryza bacillus cannot be cultivated.

It should be noted that van Dorssen¹⁴ has recently reported recovery of the coryza bacillus from the spleen of two experimentally produced cases of the rapid-onset type of disease.

DIAGNOSIS BY MICROSCOPIC EXAMINATION

In addition to the diagnosis of the coryza of slow onset associated with coccobacilliform bodies by microscopic examination, laryngotracheitis may be diagnosed by the presence of the intranuclear inclusions of the epithelial cells of the trachea as described by Seifried.¹⁵ Jungherr¹⁶ has occasionally used this as a routine method. Similarly, with some experience, the intraprotoplasmic inclusion (Bollinger) body (virus body) of fowl-pox can be used instead of comb inoculation as a means of diagnosing this infection of mucous membranes.^{17, 18}

DIAGNOSIS BY ANIMAL INOCULATION

A caseous plug in the larynx or caseous material in the eye suggests laryngotracheitis or fowl-pox. In pox the plug is usually more adherent than in tracheitis and the periorbital tissues of the eye are more swollen in this infection than in tracheitis. Pox virus is easily put in evidence by emulsifying the exudate and rubbing it into the scarified comb of a susceptible bird, which will show the easily diagnosed cutaneous lesions in from five to seven days.

DIFFERENTIATION OF LARYNGOTRACHEITIS AND BRONCHITIS

Thus, by means of a postmortem examination, bacteriological studies and animal inoculations, several diseases of the respiratory tract can be diagnosed but there still remains the problem of identifying those cases showing rhinitis, sinusitis, conjunctivitis or any combination of these with or without a mild tracheitis. Such cases are usually seen in young stock and may be laryngotracheitis, bronchitis, or the type of coryza described by Nelson¹² which is not associated with the coryza bacillus mentioned above. Since a vaccine has been developed for one of these diseases, the importance of a correct diagnosis is evident. Moreover, time is an important element because the effectiveness of emergency vaccination depends upon immediate vaccination.

The method to be used in distinguishing between tracheitis and bronchitis will depend upon (a) the number of specimens presented, (b) whether they are alive or dead, (c) laboratory facilities, and (d) the time available in which to make a diagnosis. In any event one resorts (a) to cross-immunity tests, (b)

to neutralization tests done either in birds or in embryonated eggs, or to a combination of cross-immunity and neutralization tests or finally (c) to cultivation experiments in embryonated eggs.

CROSS-IMMUNITY TESTS

When a dead specimen is presented, it can yield only virus, so that exudate is collected and emulsified for intratracheal inoculation into a bird known to be immune only to bronchitis and for intratracheal or intracloacal inoculation into a bird known to be immune only to laryngotracheitis. If the first bird develops a respiratory disease, the unknown virus must be that of laryngotracheitis and in this case the second bird does not show respiratory symptoms or fails to show a "take," depending upon the mode of inoculation. The results are usually available within 48 hours, so that this is a preferred method when dealing with dead specimens and especially if the diagnosis is urgent. The only objection to this method is that laboratory facilities may not be adequate to prevent cross-infection in the supply of immunized birds.

If known immune birds are not available, the emulsified exudate is inoculated intratracheally into two or more birds known to be susceptible to both diseases. After these birds recover from the infection, one is inoculated intratracheally with known bronchitis virus, and the other intratracheally or intracloacally with known tracheitis virus. In this case from twelve to 14 days will have elapsed before a diagnosis is available. The unknown virus may cause a disease in the inoculated bird and death in from one to five days after symptoms develop. Here the autopsy findings may be characteristic enough to justify a diagnosis of laryngotracheitis, and hence, a saving of time.

If only one live specimen is presented for diagnosis, the same procedure will have to be followed as outlined above. However, if several live specimens are available and if time is not too precious, the birds are allowed to recover and some of them inoculated with known bronchitis virus intratracheally and others with known tracheitis virus intratracheally or intracloacally. In this case the time required for diagnosis will depend upon the stage of the disease at the time the birds are presented. At any rate, within about 48 hours after the test inoculation is made, the diagnosis is available. Of the various methods this is perhaps the one most commonly employed in our laboratory. However, while these tests are being made, the poultryman is instructed to bring in fatal cases, as these may show sufficiently

typical lesions to justify a diagnosis of laryngotracheitis before the immunity tests are completed.

In some states a permit to vaccinate against laryngotracheitis is granted only when it can be established that the disease has existed on the farm. The poultryman may make no attempt to secure such a permit until long after the suspicious outbreak, but a past infection can be identified as laryngotracheitis if surviving adult birds brought to the laboratory fail to show a "take" after vaccination. Such an immunity test should never be made on the farm.

NEUTRALIZATION TESTS IN BIRDS

When immune tracheitis serum is mixed with tracheitis virus and inoculated intratracheally, the bird usually does not develop tracheitis. Similarly, an immune bronchitis serum will invariably neutralize bronchitis virus, but there is no cross-neutralization.^{19, 20} Although we have never used this method in routine diagnosis, nevertheless it could be employed. If the presented birds are affected, the unknown virus from them could be mixed with known immune tracheitis serum from one bird and known immune bronchitis serum from another bird and inoculations made into birds known to be susceptible to both diseases. Or, if the presented birds are survivors, the unknown immune serum from them is mixed with a known tracheitis and known bronchitis virus and susceptible birds inoculated. Cross-immunity tests are, however, more reliable.

NEUTRALIZATION TESTS IN EMBRYONATED EGGS

Burnet²¹ appears to be the only one to have attempted neutralization tests in the developing egg. He concluded that such a test might be used as a means of surveying the extent of latent infection among poultry. It was our idea to use the test not only as a means of determining the status of a bird with respect to laryngotracheitis, but also as a means of differentiating between this infection and bronchitis.

In preliminary experiments an attempt was made to get some idea of the concentration of virus to be used. A moderately infected chorio-allantoic membrane of the 25th generation was ground in 5 cc of broth and centrifugalized. The supernatant fluid was used to make dilutions up to 1:2,048. In one series 0.3 cc of the virus dilution and 0.6 cc of saline solution was placed in each tube. Each tube of a second series contained 0.3 cc of virus dilution, 0.3 cc of serum from a known recovered bird and

0.3 cc of saline. In a third series, serum from a normal bird replaced immune serum. These mixtures were not incubated before the eleven-day-old embryonated eggs were inoculated with 0.6 cc of the mixtures. After inoculation, the eggs were incubated six days and opened. The results showed that generalized lesions developed in eggs receiving saline and virus in dilutions up to 1:8 of the original virus suspension.

The lesions were more numerous in eggs that received more concentrated virus. The results were the same in eggs that received saline, normal serum and virus dilutions up to 1:8 of the original suspension. In the latter dilution of the original suspension, the lesions were about 2 mm in diameter. In the series that received immune serum, only two lesions occurred on each of the eggs that received the three most concentrated dilutions and, curiously enough, these were not at the points of inoculation. Thus, this test showed that immune serum exerts a definite but not necessarily a complete neutralization of the virus. But, from this test the most suitable concentration of virus to be used could not be determined. Since the amount of virus in a membrane varied anyway, it was decided to use in subsequent tests a suspension made by grinding one membrane in 5 cc or 10 cc of broth.

In a second test on January 29, two 26th-generation membranes were ground in 20 cc of broth to supply the virus. These membranes had been frozen 19 days. Four normal birds were bled to supply four samples of known normal serum. Serum was also collected from each of four birds that had been successfully vaccinated on January 15. Finally, serum was collected from each of two birds of questionable status, that is, they had been vaccinated on January 15, with dilute virus, but failed to show readable "takes." In setting up the tests, equal amounts of the virus dilution and serum were mixed. As a control, saline was substituted for serum. The mixtures stood at room temperature for one-half to 1½ hours before inoculation into ten-day-old embryonated eggs. Each serum-virus mixture was inoculated into three eggs. The eggs were incubated six days and opened.

In recording the results, no reference was made to the inoculum. The embryos of the three eggs that received virus and saline were dead and all membranes showed generalized infection. Of the four sets of three eggs each that received normal serum and virus, there was an early dead embryo in each set, but the remaining embryos were alive at the time of harvest and

in every case lesions were as large and as extensively distributed as in the control eggs.

No general statement can be made with reference to the four sets of eggs that received known immune serum and virus except that there was either complete neutralization or marked inhibition of growth. Thus, of three eggs that received immune serum 1, two showed no infection and the third showed 18 lesions about 1 mm in diameter. Of three eggs that received immune serum 2, one egg showed complete neutralization, one membrane showed one small turbid area and the third membrane showed two lesions 2 to 3 mm in diameter. Unfortunately, only one embryo of three eggs inoculated with immune serum 3 lived. The membrane showed two opaque areas at the points of inoculation. In the case of immune serum 4, two embryos lived through. One showed complete neutralization and the membrane of the second showed two lesions about 1 mm in diameter.

The tests on the questionable sera showed that both birds were immune. In the one case not one of the three eggs inoculated showed the slightest lesion. In the other case only two embryos lived through, and each showed a single lesion about 5 mm in diameter. The donors of these two samples of sera were later shown to be immune by intratracheal inoculation.

Thus, in this series there was no difficulty in identifying eggs that had received immune serum. The one egg that showed 18 lesions, and therefore spread beyond the inoculation points, was still far less extensively infected than the controls or those that received virus and normal serum. Curiously enough, aside from the early dead in the first 24 hours after inoculation the only deaths were in the controls that received virus and saline. These died on the sixth day.

In similar experiments bronchitis virus was found to be neutralized by its immune serum. Elsewhere we have reported¹⁹ that this virus does not produce lesions on the chorio-allantoic membrane but after a few passages kills the embryo. With continuous passage our strain of virus has become more pathogenic for the embryo, so that now death usually takes place on the third day instead of the fourth to the sixth day. Hence, death of the embryo is the best evidence of growth of this virus. In addition, however, the embryo is much smaller than normal and usually has very small red feet and legs. The liver is congested, and sometimes shows hemorrhages or even necrosis. The albumin of the eggs is watery and sometimes contains one

or two bubbles. The serosa seems to be more adherent than in normal eggs, or in eggs inoculated with other viruses.

A typical experiment will serve to illustrate the neutralizing properties of a bronchitis-immune serum. The virus consisted of a 28th-generation membrane removed on February 26, and held frozen until March 1, when it was ground in 5 cc of broth and centrifugalized. Equal parts of the virus suspension and immune serum were mixed and each of four eggs inoculated with a dose of 0.6 cc. As a control, equal parts of virus and broth were mixed and each of four eggs inoculated with 0.6 cc. Of these latter eggs, two embryos died on the third day, one on the fourth and one on the fifth day of incubation. The embryos of these eggs, minus the yolk-sac and membranes, weighed 6, 7.5, 9 and 6 gm, respectively. The changes were typical for this virus. The embryos of the four eggs that received serum were alive on the sixth day and absolutely normal. The embryos minus the yolk-sac and membranes weighed 15, 14, 15 and 13 gm, respectively.

A bronchitis-immune serum does not neutralize laryngotracheitis virus. Thus, on February 15, three twelve-day-old eggs inoculated with laryngotracheitis virus and immune bronchitis serum gave as good growth as the three eggs inoculated with the same virus and normal serum or the two control eggs that received virus and broth. In the same experiment, an immune laryngotracheitis serum exerted marked but not complete neutralization in three eggs and the serum of a bird immune to both diseases gave complete neutralization in the two eggs inoculated. All eggs were incubated six days.

APPLICATION IN DIAGNOSIS

Specimens received for routine diagnosis have been picked at random and bled so that neutralization tests could be made with the serum. In all but a few exceptions the bird was allowed to recover completely before bleeding so that immunity would be established. Usually equal quantities of serum and virus were mixed but in a few cases there was insufficient serum, so that once 0.6 cc of saline was added to 0.9 cc of serum to be mixed with 1.5 cc of virus. The usual dose was 0.6 cc given at three points, but occasionally 0.4 cc was used. Some mixtures were incubated up to two hours before inoculation, others for a shorter time and still others not at all. And yet, although the mixtures were not actually incubated, they were often in contact for one-half to an hour before the inoculations were completed. On the whole little difference was seen in the growth in eggs inocu-

lated immediately with laryngotracheitis-immune serum and virus and those inoculated after the mixture had been incubated.

If a diagnosis is to be based on the neutralizing power of a serum, control eggs should always be inoculated with the same amount of virus plus an equal amount of broth. And, if possible, another series of eggs should receive virus and its homologous serum. This is especially true in laryngotracheitis because neutralization is often only partial.

As a further check on the donor of a serum to be tested for neutralization of laryngotracheitis the bird was vaccinated. If the bird shows a "take," no neutralization can be expected. Occasionally a bird yields a serum that neutralizes both viruses, and this is to be expected because bronchitis is not an uncommon disease in chicks. That is to say, chicks may recover from an attack of bronchitis only to contract laryngotracheitis as adults.

The cases that follow indicate the variety of results actually encountered in field cases.

Flock GG: Three birds presented. Two showed localized infections of the nasal passages and sinuses and *Pasteurella avicida* isolated from each. Third bird showed mucus in trachea, acute swelling of liver, turbidity of mesentery, and ova had cooked appearance. Liver culture negative. Bled February 5 and serum tested against laryngotracheitis and bronchitis virus on March 1. Lesions as extensive in eggs receiving serum and laryngotracheitis virus as in eggs receiving virus and saline. Of three eggs receiving serum and bronchitis virus, one embryo died on the fifth day and two were alive, but all showed typical changes. Of four eggs that received virus and broth, two died on the third day, and one each on the fourth and fifth days. Of four eggs that received virus and known immune serum, all embryos were alive and normal on the sixth day.

Interpretation: No neutralization of laryngotracheitis or bronchitis virus; localized fowl cholera infection.

Flock K: Two birds presented. Nasal discharge in each. *P. avicida* isolated from only one bird. Other bled on March 3, and serum tested against both viruses on March 15. Of two eggs inoculated with serum and laryngotracheitis virus, one showed no growth and the other one lesion 3 mm in diameter. Both control eggs receiving virus and saline showed excellent generalized growth. Of three eggs inoculated with serum and bronchitis virus, all embryos were alive and normal on sixth day. The three control eggs that received bronchitis virus and saline were dead on the third day.

Interpretation: Serum contained neutralizing bodies for both laryngotracheitis and bronchitis.

Flock P: A bronchitis in chicks purchased from a hatchery spread to a flock of 1,200 pullets with no deaths in the latter. Bird bled March 10 and tested against both viruses on March 15. Same test virus here as that used in flock K and the same laryngotracheitis controls. The two eggs showed as extensive growth as the controls. Of three eggs that received serum and bronchitis virus, one died on the fifth day and one on the third and both typical of bronchitis. The third embryo which was dying on the third day was not typical.

Of three controls that received bronchitis virus and broth, two were dead on the third day and one was dying; all typical.

Interpretation: No neutralization of laryngotracheitis virus. In fact, the donor was vaccinated later and showed a "take." Neutralization of bronchitis virus questionable.

Flock T: Six birds presented. Four showed fowl-pox and *P. avicida* was isolated from localized infections of two of these. Two birds showing gasping symptoms were vaccinated on March 22, and showed "no takes" on March 27. One bled before vaccination and tested on March 26 against both viruses. The two eggs inoculated with serum and tracheitis virus showed as heavy growth as the three inoculated with virus and saline. Of three eggs inoculated with serum and bronchitis virus, two lived through the sixth day and were normal but the third was dead on the second day. Four control eggs received known immune bronchitis serum and virus and lived through the sixth day and were normal. Three control eggs received bronchitis virus and saline, which killed two embryos on the third day and the other was dying on the sixth.

Interpretation: Donor had had laryngotracheitis because it was shown to be immune to vaccination; no accounting for failure to neutralize this virus. Suggestive neutralization of bronchitis virus.

Flock F: One bird from a flock showing a mild respiratory disease. Bird bled and vaccinated on March 22, showed "take" on March 24. Serum tested on March 26 only against laryngotracheitis. Same controls as used with flock T. Growth in three eggs receiving serum as heavy as in controls.

Interpretation: No neutralization, which checks with the vaccination result. Probably a case of bronchitis.

Flock E: Outbreak of mild respiratory disease in five pens, one death. Presented March 30 and one bird bled after recovery. Serum tested on April 5 against laryngotracheitis virus. Of three eggs inoculated with serum and virus, the embryos died on the fourth, fifth and sixth days, respectively, and the membranes showed very heavy growth. Three control eggs that received virus and saline died on the seventh day and showed extensive growth.

Interpretation: No neutralization, probably an outbreak of bronchitis.

Flock Th: Flock had "colds" all winter. One of two birds presented had a nasal discharge. Both vaccinated on March 29 and both showed "takes." One bled on March 29 and tested against laryngotracheitis virus. Same virus used as in flock E and hence same controls. Of four eggs inoculated with serum and virus, all embryos were alive on seventh day and the degree of infection was somewhat less extensive than in the controls.

Interpretation: No neutralization, thus checking with vaccination results.

Flock H: This flock had been vaccinated in September, but a mild respiratory disease appeared. The presented bird was bled and then vaccinated but failed to react. The serum tested only against laryngotracheitis virus on April 26. Of two eggs that received serum, both showed the three inoculation-point lesions and a few small secondary lesions. In contrast, the control eggs that received virus and saline showed such heavy growth that the lesions were mostly confluent.

Interpretation: Marked neutralization. Mild disease probably bronchitis.

Flock Pr: Outbreak of mild respiratory disease. Bird vaccinated after bleeding and showed a "take." Tested on May 24 against both viruses. Of two eggs that received serum and laryngotracheitis virus, both showed inoculation-point lesions 4 mm in diameter and scattered

smaller secondary lesions. As a control, serum from flock H was used. Of the two eggs inoculated, one showed no lesions and the other showed one inoculation-point lesion 2 mm in diameter. Of the six eggs inoculated with serum and bronchitis virus, all lived through seven days and were normal. Of six controls inoculated with virus and broth, one died on the third day and three were dying, one died on the fourth day and one was still alive on the eighth day but all showed typical changes.

Interpretation: No neutralization of laryngotracheitis virus, which confirms the vaccination result. Neutralization of bronchitis virus.

Flock Kn: Flock vaccinated eight days previously. Of 25 birds read, all were said to show "takes," but about 100 out of 750 showed mild respiratory symptoms. The presented bird was vaccinated and shown to be immune to tracheitis. Its serum was tested against bronchitis virus on May 17. Of four eggs inoculated, two embryos died on the fourth day and two were dying at this time; all showed typical changes. Of five control eggs that received virus and saline, one died on the second day, two on the third day and two were dying at this time.

Interpretation: No neutralization of bronchitis virus. Probably some of the birds were not successfully vaccinated and these contracted respiratory infection.

CULTIVATION IN EGGS AS A MEANS OF DIAGNOSIS

Bronchitis virus is quite easily filtered and may be inoculated directly into nine to twelve-day-old eggs. Although we have not used this as a routine measure and, therefore, are not familiar with the possibilities, it is true that our present strain of this virus did not begin to kill embryos consistently until about the seventh generation. If this be true of all strains, the method would not be practical as a diagnostic procedure. On the other hand, laryngotracheitis virus is more difficult to filter, but if any virus is present it will provoke lesions in the first generation that will be visible on the fourth or fifth day after inoculation. At least three eggs should be inoculated and preferably more.

As further evidence, although not necessary, the unknown filtrate may be combined with bronchitis and laryngotracheitis-immune sera and two additional series of eggs inoculated.

ADVANTAGES OF USING EGGS

In routine diagnosis the quickest method is always the best, if it gives reliable results. For this reason if recovered birds are presented to be tested for immunity to the two viruses, the best method is by direct inoculation as already described. If affected birds are presented and the virus is to be identified, the birds have to be held and then tested for immunity by direct inoculation. The only disadvantage to this method is that some time is lost which may be shortened by an attempt to identify the virus by inoculation into birds immune to laryngotracheitis

and bronchitis or by inoculation of a filtrate into embryonated eggs. But, in attempting to keep birds immune to these two viruses, cross-infection takes place too often, so that birds become immune to both diseases. Thus, embryonated eggs offer a better method of control. Similarly, immune sera can be collected from birds soon after recovery or immunization against each of the viruses and stored until needed.

In our experience an animal-room soon becomes filled with birds on test during the winter months. These require considerable care and feed. By the use of embryonated eggs, routine diagnosis can be simplified.

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CHAIRMAN WESTMORLAND: We enjoyed your paper very much, Dr. Beaudette.

The next paper, "Erysipelas Outbreaks in Turkey Flocks," is by Drs. Henry Van Roekel, K. L. Bullis and M. K. Clarke, of the Department of Veterinary Science, Massachusetts State College, Amherst, Massachusetts. (Applause)

. . . Dr. Van Roekel read the paper. . . .

ERYSIPELAS OUTBREAKS IN TURKEY FLOCKS*

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During the past year, disease outbreaks due to *Erysipelothrix rhusiopathiae* were observed in three widely separated turkey flocks. The three outbreaks were encountered within a period of five weeks. Whereas, *E. rhusiopathiae* is usually recognized as affecting principally swine, the occurrence of this organism in disease outbreaks of turkeys is of interest. During the past three years, outbreaks of erysipelas in turkeys in the United States have been reported by Beaudette and Hudson¹ and by Madsen.² An extensive review of the literature concerning swine erysipelas has been published by Van Es and McGrath,³ who report that *E. rhusiopathiae* may be pathogenic for man, cattle, swine, sheep, dog, rabbit, guinea pig, mice, turkey, chicken, geese, ducks, mud-hen, pigeons, parrot, quail and other smaller wild birds, as well as birds in zoölogical gardens. The disease aspects mentioned for this organism were greatly similar to those which will be reported for the outbreaks in question. The three outbreaks came to our attention through our routine diagnostic service. It was not possible to conduct as thorough an investigation of the disease as one would like in cases of this type. The observations made, however, are of scientific and practical interest to the veterinary, and possibly, the medical professions.

NATURAL OUTBREAKS

Flock 1: The flock consisted of approximately 120 five-month-old White Holland turkeys located in the south central portion of Massachusetts. The flock was confined in two houses (12 x 12 ft.) provided with wire platforms (12 x 24 ft.). The owner had observed cannibalistic manifestations since the poults were ten to twelve weeks of age. For six weeks prior to the outbreak of the disease, one to two birds died each week due to cannibalism.

Date of outbreak: On October 30, 1936, the owner observed an abnormal mortality which could not be attributed entirely to cannibalism. Two days later, the flock appeared less active and feed consumption had decreased. Blue discoloration of the head and abnormal droppings were also reported by the owner. Birds in both pens were affected but the exact number of birds infected

*Contribution No. 289 of the Massachusetts Agricultural Experiment Station.

was not determined. The course of the disease extended approximately over a two-week period with a mortality of nearly 10 per cent.

Necropsy findings: Five turkeys (two alive and three dead) were submitted to the laboratory for examination. The two live specimens exhibited symptoms of general weakness; inactivity; cyanotic and congested skin; and dyspnea. One bird showed a diarrhea. This bird had a temperature of 104° F. Dried blood



Fig. 1. Hemorrhages in the skin due to *Erysipelothrix rhusiopathiae* infection in the turkey.

was observed in its oral cavity, which apparently came from an ulcerated mucosa of the nasal passage. Both birds died within a few hours after arrival at the laboratory and in one, mild convulsions preceded death.

Lesions observed consisted of pronounced petechial and diffuse hemorrhages in the cutaneous and subcutaneous tissues; muscles (especially those in the pectoral, thoracic and thigh regions); fascial tissues; peritracheal tissues; pericardium; epicardium; myocardium; endocardium; pleural and peritoneal tissues; lungs; spleen; and small intestine. These hemorrhages were not present in all organs and tissues in the same bird. Hemorrhages



Fig. 2. Hemorrhages in the fascial and muscle tissues, due to *Erysipelothrix rhusiopathiae* infection in the turkey.

were most frequently observed in muscles and fasciae of the pectoral and thigh regions and in serous membranes of the heart, pleural and peritoneal cavities. Refer to figures 1, 2, 3 and 4.

In some cases the liver appeared mottled and congested and the spleen exhibited extensive necrotic and hemorrhagic areas. The splenic pulp appeared somewhat dessicated and crumbled on pressure. In some cases the kidneys appeared enlarged and

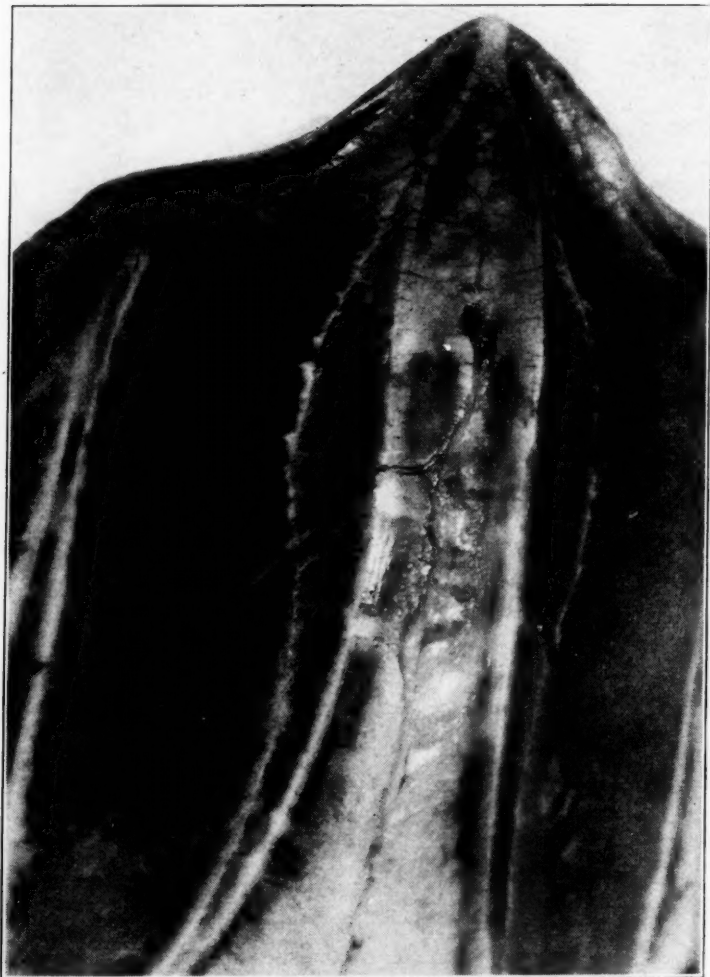


Fig. 3. Hemorrhages in the serous membrane of the peritoneal and pleural cavities, due to *Erysipelothrix rhusiopathiae* infection in the turkey.

congested. The intestines contained a catarrhal exudate which was sanguineous in some cases. In others the mucosa of the small intestine might be hemorrhagic and necrotic. The crop mucosa and the tissue subjacent to the gizzard lining exhibited hemorrhages in a few cases. The digestive tract contained little or no feed. There was some evidence of a naso-pharyngeal catarrh.

Bacterial cultures were made from all birds examined. Table I gives the results of the bacteriological examinations. Cultural characteristics of the isolated strains resembled those of *E. rhusiopathiae* and will be presented later in this paper.

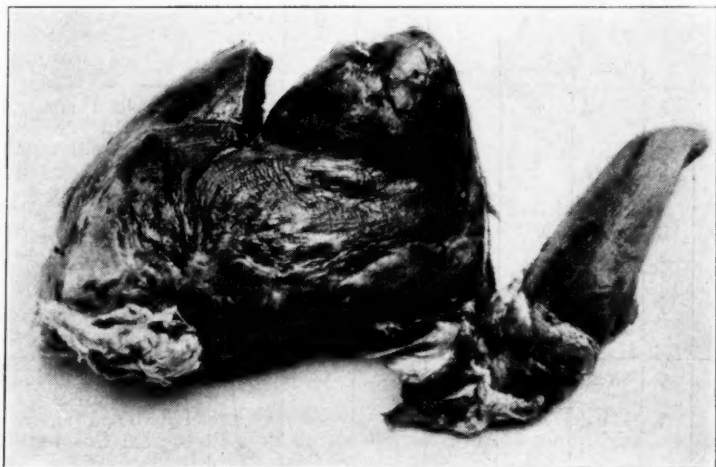


Fig. 4. Turkey heart showing hemorrhages, due to *Erysipelothrix rhusiopathiae* infection.

Origin of infection: The source of the infection was not determined. Other animals on the same premises with the turkeys included one cow and one domestic rabbit. Wild pigeons had frequented the farm during the summer months. Rats had been observed in and around the shelter houses. No garbage had been fed to the turkeys.

Treatment of flock: The owner reported that, approximately six days after the outbreak of the disease was observed, 91 out of 101 birds remaining were given 10 cc of swine erysipelas antiserum intraperitoneally by a veterinarian. At this time, the flock was liberated from its confinement and given the run of the yard. Two days after the administration of antiserum, two of the treated birds were observed to be sick. One of these sick

birds died four days after the treatment. From then on, the flock improved rapidly and no further losses could be attributed to the disease. It is difficult to state the benefit derived from the antiserum treatment, since an insufficient number of turkeys were retained as controls.

Flock 2: This flock was located in Vermont and consisted of approximately 10,000 birds, which were purchased as young

TABLE I—Isolation of *E. rhusiopathiae* from turkeys.

FLOCK	SPECIMEN	CONDITION RECEIVED	ORGANS AND TISSUES CULTURED*					REMARKS
			PERICARDIAL FLUID	HEART	LIVER	SPLEEN	NASAL MUCOSA	
1	1	Dead	+	+	+	NC	NC	Heart-blood smear revealed a few slender Gram-positive rods
	2	Alive	+	+	+	+	NC	Bird died a natural death shortly before necropsy
	3	Alive	NC	+	+	NC	NC	Bird died a natural death shortly before necropsy
	4	Dead	NC	NC	+	NC	NC	Intestine and sinus exudate negative
	5	Dead	NC	+	+	NC	+	
2	6	Dead	—	—	—	—	NC	Exhibited lesions of entero-hepatitis
	7	Dead	NC	+	+	+	NC	Heart-blood smear revealed Gram-positive rods
	17	Alive	NC	—	NC	—	—	Peritoneal fluid negative
	18	Alive	NC	—	NC	—	—	Organisms resembling <i>E. rhusiopathiae</i> but lost in isolation efforts
	8	Dead	NC	—	NC	—	+	Exhibited lesions of entero-hepatitis
	9	Dead	NC	+	—	NC	NC	
	10	Dead	NC	NC	—	—	—	
	11	Dead	NC	+	NC	—	NC	
	12	Dead	NC	NC	+	NC	NC	
	13	Dead	NC	+	NC	+	NC	
	14	Dead	NC	NC	+	+	NC	
	15	Dead	NC	+	NC	+	+	
	16	Dead	NC	+	NC	+	—	
	19	Dead	NC	+	+	+	—	
	20	Dead	+	+	+	+	+	

*+ *E. rhusiopathiae* isolated.

— *E. rhusiopathiae* not isolated.

NC No cultures.

poults from sources in various states. The flock was divided into two groups which had been started in shelters provided with wire porches. When ten weeks of age, they were moved to a 125-acre range provided with range feeders and flat roosts. The range was located on a hillside which had been used for a cow pasture shortly prior to the time the turkeys were moved onto it. The character of the soil was dark, rich in decayed vegetation, and had areas covered with charcoal ashes from the brush that had been cut and burned recently. Springs and damp places were also present.

Date of outbreak: On October 15, 1936, the owner first observed the trouble in one portion of the flock. Ten days later, the other group manifested evidence of disease. The flock symptoms described by the owner were less activity, a reduction in feed consumption, listlessness, diarrhea, and a retardation in growth. The dead birds examined by the owner were reported to have a redness of the skin, blood around the heart and in the muscles. These findings were at first attributed to bruises as the result of flying against stumps, stones and trees in the pasture. On October 27, the dressing of birds for market was started and, by November 8, approximately 2,000 birds had been slaughtered, among which 40 did not dress well. The mortality was estimated at 300 birds. Dressing operations no doubt greatly altered the course of the disease, since the owner selected for slaughter birds which showed inappetence and other symptoms. The entire flock had been dressed off by November 22.

Necropsy findings: Thirteen specimens were submitted to the laboratory for examination. The symptoms and lesions were similar to those observed in flock 1. Bacteriological examination was made of all specimens submitted and results are given in table I. The characteristics of the *E. rhusiopathiae* strain isolated will be presented later in the paper.

Origin of the infection: The source of the infection was not determined. The owner reported that the following animals frequented the turkey range: foxes, skunks, raccoons, rabbits, crows and sparrows. Other animals on the farm were horses, cows, dogs and hogs. The hogs had no contact with the turkeys. No garbage was being fed to turkeys or hogs, although the latter were fed about 150 diseased dead turkeys with apparently no ill effects. Some of the dead turkeys were also eaten by the dogs with no ill results.

Treatment of flock: The owner reported that the treatment of the flock consisted of moving the birds to new ground. Epsom salt and sulfur were administered without noticeable effect. On

October 20 and 28 and November 4, the flock was given a milk flush which brought about some improvement after each treatment. It is difficult to evaluate the beneficial influence of the milk flush on the course of the disease because other factors such as the rapid slaughter of sick and apparently normal birds and the movement of the flock to new ground no doubt contributed to altering the duration of the outbreak. In fact, the entire flock was disposed of within approximately five weeks after the disease was observed. Sick and dead specimens were observed up to the time the last bird was slaughtered.

Flock 3: This flock, situated near the Massachusetts border line in New York State, consisted of 1,900 turkeys which originated from a commercial hatchery. The flock was divided into two groups, one having access to a shelter while the other ranged and roosted in the open. The disease was encountered only in the latter group. The birds were maintained on a 30-acre range provided with turkey feed hoppers which were moved frequently.

Date of outbreak: The owner first observed the disease on November 30. The owner described the sick birds as sluggish, depressed and suffering from cold. Slaughtering operations were commenced immediately after the outbreak was observed and approximately 200 birds had been dressed by December 9. Some of the slaughtered birds failed to bleed out well. The mortality rate was from five to nine birds per day, with a total mortality of 60 birds. The affected group of turkeys was moved to quarters provided with a shelter, as some of the turkeys also exhibited a condition which resembled coryza. It is possible that the coryza-like symptoms, as detected by the owner, may have been due to the erysipelas infection, since specimens examined from these outbreaks revealed inflammatory changes of the mucosa of the nasal passage.

Necropsy findings: Two dead specimens were submitted to the laboratory for examination. Both exhibited lesions similar to those found in birds from flocks 1 and 2. Bacteriological findings are reported in table I.

Origin of infection: The source of the infection was not determined. This was the first year turkeys were being raised by the owner. No other live stock was being maintained on the premises excepting 12,000 chickens which were confined in batteries. No garbage was being fed to the turkeys.

Treatment of the flock: The owner reported that no medicinal treatment was administered. The owner concluded that the movement of the sick flock to sheltered quarters and the slaughtering of birds influenced the outcome of the disease. The entire

flock was disposed of approximately four weeks after the outbreak of the disease.

BACTERIOLOGICAL FINDINGS

Bacteriological examination was made of the 20 specimens received from the three flocks. The condition of the carcasses of several of the specimens was hardly suitable for the isolation of bacteria. Chicken-infusion-agar plates were inoculated generously with material from the various organs and tissues cultured. *E. rhusiopathiae* was readily isolated and appeared as delicate, small, transparent colonies within 24 hours. Confluent colonies gave a grayish cast to the agar surface. The growth was not abundant, even after a prolonged incubation period. The results of the isolations are given in table I.

TABLE II—Identity and history of 25 strains studied.

STRAIN	ISOLATED	SOURCE
1	11- 2-36	Flock 1, bird 1, pericardial fluid
2	11- 2-36	Flock 1, bird 2, heart
3	11- 4-36	Flock 1, bird 3, heart
4	11- 4-36	Flock 1, bird 4, liver
5	11- 4-36	Flock 1, bird 5, nasal mucosa
7	11- 9-36	Flock 2, bird 7, liver
8	11-16-36	Flock 2, bird 8, nasal mucosa
9	11-16-36	Flock 2, bird 9, heart
11	11-16-36	Flock 2, bird 11, heart
12	11-16-36	Flock 2, bird 12, liver
13	11-16-36	Flock 2, bird 13, spleen
14	11-16-36	Flock 2, bird 14, liver
15	11-16-36	Flock 2, bird 15, nasal mucosa
16	11-16-36	Flock 2, bird 16, spleen
19	12-10-36	Flock 3, bird 19, liver
20	12-10-36	Flock 3, bird 20, nasal mucosa
87	—	Culture 75395 isolated from swine erysipelas hogs, received from Dr. Van Es
88	—	Culture 57107 isolated from swine erysipelas hogs, received from Dr. Van Es
90	—	Culture 806, <i>E. rhusiopathiae</i> , received from American Type Culture Collection
91	—	Culture 4162, <i>E. murisepticae</i> , received from American Type Culture Collection
92	—	A B C Rotlauf, <i>E. rhusiopathiae</i> , isolated by Dr. Ten Broeck, received from Dr. Beaudette
93	11-17-34	Culture 11, <i>E. rhusiopathiae</i> , isolated from turkey by Dr. Beaudette
94	—	Culture P ₂ Ery., <i>E. rhusiopathiae</i> , isolated from hogs, received from Dr. Lee
96	—	Culture Teague, <i>E. rhusiopathiae</i> , isolated from hogs, received from Dr. Lee
97	—	Culture 69274 isolated from swine erysipelas hogs, received from Dr. Van Es

It may be observed from the data in table I that *E. rhusiopathia* was isolated from 16 to the 20 turkeys examined. The organism was isolated from different sites in the birds. In some cases when negative results were obtained, the isolation was complicated with contamination due to the condition of the specimen. It seems likely that in the large majority of turkeys examined, the disease was present in a septicemic form.

Cultural studies: Twenty-five cultures, including one known *E. murisepticae* strain, eight known *E. rhusiopathiae* strains and 16 strains isolated from turkey specimens received at the laboratory, were studied. The identity and the history of the 25 strains are given in table II.

Biochemical, cultural and morphological characteristics of the single *E. murisepticae* strain and the 24 *E. rhusiopathiae* strains were studied in a number of different media. Ability to attack fermentable substances was studied in a serum-water medium which was similar to the formula of Hiss except that serum from cattle blood was substituted for sheep serum. Results were comparatively uniform. All 24 *E. rhusiopathiae* strains failed to attack arabinose, dextrine, dulcitol, inositol, inulin, maltose, mannitol, raffinose, rhamnose, salicin, sorbitol, sucrose and xylose. All of these strains attacked dextrose, galactose, lactose, levulose and mannose to produce acid sufficient in some, though not all, to cause coagulation of the medium. Nine *E. rhusiopathiae* strains were noticeably slower in attacking mannose. Xylose might have been considered as attacked by eight strains by the eighth day though the change was slight. A variability in the fermentation of two carbohydrates (mannose and xylose) was observed among the isolated and known strains of *E. rhusiopathiae*.

The *E. murisepticae* strain did not attack arabinose, dextrine, dulcitol, inositol, inulin, maltose, mannitol, mannose, raffinose, rhamnose, salicin, sorbitol and xylose. It attacked dextrose, producing acid and coagulation; produced acid in levulose and sucrose, and very late in galactose and lactose. Observations of reactions were made at two, three, four, five, seven and eight days. Only ten strains were examined in hanging-drop preparation of 18-hour chicken-infusion-broth culture for evidence of motility. All were found to be non-motile. None of the strains produced indol when grown in tryptophane broth and tested according to Ehrlich's method. Also none of the strains produced hydrogen sulfide in lead-acetate-agar stab cultures. Growth with no darkening of the medium, was observed along the needle track. Growth of all *E. rhusiopathiae* strains in gelatin stab was

of the characteristic shape described as "test-tube brush." The diameter of the "brush" increased from 2 to 3 mm, at 24 hours, to 7 to 8 mm by the end of the week. *E. murisepticae* gave a more arborescent shape of growth, which increased in extent toward the end of a week. *E. rhusiopathiae* cultures showed one of two types of growth in chicken-infusion broth after incubation for 48 hours. Thirteen produced slight turbidity with more or less sediment. Eleven produced more turbidity with practically no sediment and viscosity in the medium. *E. murisepticae* produced distinct turbidity with flaky sediment. Gelatin was incubated at cool-room temperature (about 20 to 22° C.) and all other media at 37.5° C.

In Gram-stained preparations all strains appeared in general as small rods, varying somewhat in length and with formation of short chains. Some individual organisms appeared curved with some tendency toward short filaments suggestive of pleomorphism. In the ability to hold the Gram stain there was great variation. *E. murisepticae* was Gram-negative. Of the *E. rhusiopathiae* strains, five were mostly Gram-positive, two mostly Gram-negative, and four Gram-positive, five Gram-negative and eight about half and half. Variability in the Gram-stain reaction was encountered among the isolated strains and the strains received from other workers. In one strain the rods were very short, with much greater uniformity of size and shape. Seven contained noticeably curved organisms, seven were more filamentous, and two seemed to have produced more chains.

ANIMAL INOCULATION AND AGGLUTINATION STUDIES

Fifteen strains (including seven strains received from other workers and eight strains isolated from turkeys) were subjected to animal passage in the chicken to determine their behavior in laboratory animals and their ability to stimulate the production of agglutinins. Their agglutinability also was studied.

Seventeen chickens (four to five months of age) were inoculated with saline suspensions of the organism prepared from a 24-hour agar culture and adjusted to a turbidity of approximately tube 1 of the McFarland nephelometer. At the start, all birds but two were given three inoculations (1 cc each) intraperitoneally. The time periods between the first and second and second and third inoculations were three and seven days, respectively, excepting in a few instances. Approximately six weeks after the first inoculation, five birds (A6, A7, A31, A45 and A53) were given three successive daily inoculations of 2.0 cc each to raise the agglutinin titre of the individuals. Clinical observations were

made daily and the majority of birds were maintained for at least a period of six weeks. During this period, their sera were tested for agglutinins, using the macroscopic tube agglutination test. The antigen was prepared from 48- to 72-hour-old cultures, suspended in 0.5 per cent phenolated normal saline. The dilutions of 1:10 and higher were employed. Table III gives a summary of the results concerning animal inoculation and agglutinin production.

Clinical observations on the inoculated birds revealed a systemic reaction in birds A3, A6, A17, A36 and A432. The birds exhibited inactivity, somnolence and a loss of appetite. Two birds (A3 and A36) died within a few days after the first inoculation. Three birds (A17, A29, A316) died from three to five weeks after the first inoculation. The necropsy findings of these birds were as follows:

Bird A3. Observations: Blotchy and congested appearance of pectoral muscles; slightly enlarged liver; slightly pale and enlarged kidneys; pale heart muscle. *E. rhusiopathiae* was recovered.

TABLE III—Summary of data on animal inoculation and agglutinin production.

ANIMAL	STRAIN	DOSES	AGGLUTINATION TITRE		DAYS AFTER FIRST INOCU- LATION	NECROPSY	
			MAX- IMUM	NE- CROPSY		GROSS LESIONS	ISOLATION OF <i>E.</i> <i>RHUSIO- PATHIAE</i>
A 3	93	2	—	—	5	Refer to context	Positive
A 6	9	3	10,240	10,240	53	None	Negative
A 7	90	3	2,560	2,560	53	Mild epicarditis	Negative
A 17	19	3	2,560	—	21	Refer to context	Positive
A 20	7	3	640	40	42	None	Negative
A 22	97	3	640	160	42	None	Negative
A 24	92	3	5,120	1,280	42	None	Negative
A 25	1	3	320	320	42	None	Negative
A 29	20	3	5,120	5,120	32	Refer to context	Positive
A 31	91	3	20,480	20,480	53	None	No cultures
A 36	5	2	—	—	6	Refer to context	Negative
A 45	93	3	2,560	2,560	49	None	Negative
A 48	5	3	1,280	80	38	None	Negative
A 53	2	3	40,960	40,960	53	None	Negative
A 307	94	3	640	320	42	None	Negative
A 316	87	3	5,120	—	27	Refer to context	Positive
A 432	8	3	320	160	42	Few small he- patic hemor- rhages	Negative

Bird A17. Observations: Sudden death; feed and water containers empty; skin of pectoral region and its underlying structures cyanotic; blood-vessels injected; blood dark and partially coagulated; liver slightly enlarged and of firm consistency with a surface presenting a grayish cast; spleen slightly enlarged and cut surface grayish in color; kidneys slightly enlarged; intestines contained mucocatarrhal material; rectal mucosa hemorrhagic. Vegetations were present on the left cusp of the bicuspid valve. The gizzard was filled with feed. *E. rhusiopathiae* recovered.

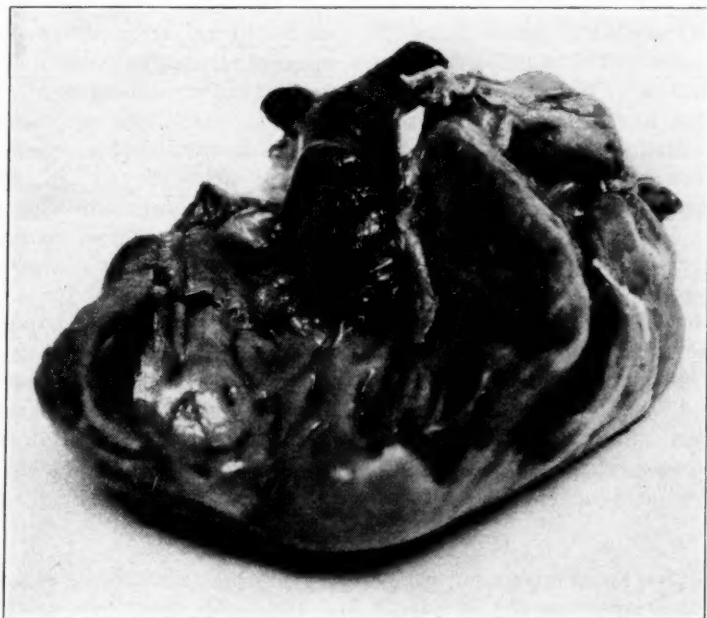


Fig. 5. Vegetative endocarditis and thrombosis in chicken heart due to *Erysipelothrix rhusiopathiae* infection.

Bird A29. Observations: Sudden death; muscles apparently normal; liver and kidneys slightly enlarged; spleen slightly enlarged and necrotic; mild enteritis; heart slightly enlarged; epicarditis; slight hydropericardium; left ventricular wall atrophied and necrotic; vegetations of the bicuspid valve with thrombus attached to one cusp. (Refer to figure 5.) *E. rhusiopathiae* recovered.

Bird A36. Observations: Pectoral and thigh muscles congested and dark in color; liver and kidneys enlarged; and mild enteritis. *E. rhusiopathiae* recovered.

Bird A316. Observations: Sudden death; feed and water containers empty; pectoral and thigh muscles slightly congested and dark in color; blood partly coagulated; liver firm and congested; spleen enlarged and of soft consistency; kidneys slightly enlarged; cardiac vessels injected; bicuspid valve exhibited erosions, vegetations and thrombosis; tricuspid valve exhibited suspicious vegetations. *E. rhusiopathiae* recovered.

Agglutinins were detected in all inoculated birds excepting two that died shortly after the first inoculation. Agglutinin production responded rather quickly, since the majority of sera caused agglutination seven days after the birds were first inoculated. Moderately high titres were obtained in the majority of birds at 14 days. Three additional daily inoculations, administered six weeks after the first injection, caused the titres to be raised to a fairly high level in five birds (A6, A7, A31, A45 and A53). Cross-agglutination tests applied to sera from all birds revealed typical agglutination which varied little as to degree for the different strains and sera. However, reciprocal agglutinin-absorption tests failed to reveal antigenic differences in the strains, since agglutinin titres could be altered only slightly or not at all by repeated absorption. No satisfactory explanation for this failure to absorb agglutinins was forthcoming excepting that the absorption dose may have been lacking in concentration.

One pigeon and two rabbits were inoculated with cultures isolated from flock 1. The pigeon died within four days after inoculation and the organism was recovered in pure culture. Of the two rabbits, one died after nine days and the other after four days. *E. rhusiopathiae* was recovered from the latter.

DISCUSSION AND SUMMARY

Three spontaneous outbreaks of erysipelas encountered among turkeys are reported in this paper. It is of interest to note that the disease occurred in three widely separated flocks and at approximately the same time of the year. The time of the outbreaks of the disease may in part be associated with the change in climatic conditions which occurred shortly before the disease was observed. As to the origin of the infection, no definite source could be incriminated but according to the properties of *E. rhusiopathiae* as reported by Van Es,³ the organism may exist in the soil as a saprophyte and pathogenic types can grow in soil without a loss in virulence. It is reported that the organism is very sensitive to heat and that a temperature of 112° F. may be lethal.

Erysipelas in turkeys and chickens has features in common with the disease as observed in swine. It may appear in acute

and subacute forms. Recovery in some acute cases may be complete within a week or ten days. Very pronounced and striking pathologic changes were observed in the spontaneous cases in turkeys, and the lesions observed in both the turkeys and in the artificially infected chickens were in many respects identical with those encountered in swine. In the majority of specimens examined, hemorrhages of various sizes might be present in the different tissues and organs. Vegetative endocarditis has been produced in artificially infected chickens.

Mortalities in the three natural outbreaks were not great, although the potential mortality loss probably would have exceeded the actual if the slaughtering operations had not been undertaken. Few slaughtered carcasses were reported as discarded due to an unmarketable condition. Unquestionably diseased birds were marketed for human food consumption and the subsequent damage these carcasses may have caused remains a question. In the interest of providing sound and wholesome meat for human consumption, the disposal of diseased carcasses for food purposes should attract the attention of our official meat inspectors and our live stock sanitary officials.

E. rhusiopathiae was isolated from 16 out of 20 turkeys examined. The isolated strains were identified morphologically, biochemically and culturally, using known strains of this organism as controls.

Experimentally inoculated chickens manifested transitory symptoms and five among 17 died from the infection. Agglutination studies revealed that agglutinins were produced in chickens and that known strains of *E. rhusiopathiae*, as well as those isolated from the turkeys, were agglutinated by homologous and heterologous sera.

In conclusion it may be stated that *E. rhusiopathiae* infection in adult turkey flocks may cause serious losses in the form of mortality, retardation in growth, and less profitable marketing of carcasses for food consumption.

ACKNOWLEDGMENTS

The authors wish to extend their appreciation to the following persons for their kindness in submitting strains of *E. rhusiopathiae*: Dr. F. R. Beaudette, New Jersey Agricultural Experiment Station, New Brunswick, N. J.; Dr. C. D. Lee, Iowa Agricultural Experiment Station, Ames, Iowa, and Dr. L. Van Es, University of Nebraska, Lincoln, Neb.

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DISCUSSION

CHAIRMAN WESTMORLAND: Thank you, Doctor Van Roekel.

DR. J. D. RAY: I would like to ask if there has been any possibility that some of these flocks of turkeys with swine erysipelas might have picked up this infection through some fish by-products? It seems to be a problem to explain. As I understand it, they have hundreds of cases of so-called fish disease along the Atlantic Coast, and that is definitely the same infection as we have in this country in swine. I am wondering if that might be a factor.

DR. VAN ROEKEL: I cannot tell you exactly, now, what the diet consisted of, but it might be that there were fish products in the rations.

CHAIRMAN WESTMORLAND: The next paper is "The Importance of Meat Inspection of Poultry to Public Health," by Dr. C. E. Edmunds, Supervising Inspector of Poultry, Bureau of Agricultural Economics, Chicago, Illinois.

The author is not able to be present, and Dr. Erwin Jungherr, of Connecticut, will read the paper. (Applause)

. . . Dr. Jungherr read the paper. . . .

POULTRY INSPECTION

By C. E. EDMUNDS, *Chicago, Ill.*

*Supervising Inspector, Bureau of Agricultural Economics
United States Department of Agriculture*

The objective of this report and, I believe, the desire of the entire Committee on Meat and Milk Hygiene is to call the attention of members of this Association to what is being done in this country relative to the inspection of poultry, and also the possibilities and desirability of inspection of poultry at time of slaughter in a manner similar to that of all meat food products.

Previous to the year 1928, little, if any, effort had been given to this important work. About that time the New York City health authorities placed a regulation in their sanitary code prohibiting the sale of eviscerated poultry in that city, unless it had been previously inspected and identified as such by an authorized agency which would be acceptable to them. This regulation naturally affected particularly the packers of canned poultry products who marketed their products in that city. They at once began to investigate the possibilities of federal inspection of their products, but since the Meat Inspection Act did not include poultry, it was not possible for the Bureau of Animal Industry to offer such inspection. However, an act of Congress, known as the Food Products Inspection Act, authorizes the

Bureau of Agricultural Economics, U. S. Department of Agriculture to inspect all perishable farm products including inspection and certification of dressed poultry for condition. Thus was the beginning of a very much needed inspection service, which is advantageous to the consumer, the packer, the producer and the profession.

Since the inauguration of poultry inspection in 1928, other cities have passed regulations similar to those of New York City, prohibiting the sale of uninspected poultry products, and therefore almost all of the packers of canned poultry are now utilizing this inspection service, having their products identified as being inspected, by labeling them with the inspection legend of the Bureau of Agricultural Economics which reads, "Inspected and Certified by Bureau of Agricultural Economics, U. S. Department of Agriculture."

METHODS USED

A brief description of how such inspection of poultry is conducted is as follows:

Electric motor-driven conveyor equipment is used similar to that employed in the large slaughter-houses for small animals. It consists of a series of stainless steel or monel metal pans, and on each revolution the pans go through a washing and sterilizing chamber. As the birds are conveyed along the line, the abdominal and thoracic cavities are opened by plant employees to permit the inspection of all internal organs. A federally licensed veterinary inspector then inspects each bird, which is either passed or rejected by him. Birds which are rejected as unfit for food are either incinerated or denatured in such a way as to make them unfit for human consumption. Those which are passed are conveyed to a conveyor eviscerating-table and after head and feet and all internal organs are removed, including the kidneys, they are then thoroughly washed by hand under a pressure washer, and are ready for processing or preparation for market.

The duties of a veterinary inspector of dressed poultry are not only to make a postmortem inspection of the poultry used, but also to see that the plant is kept in a sanitary condition, and that all processing is carried on under sanitary methods, and the products prepared in accordance with approved formulas and properly labeled.

Of late years, inspection of poultry has not been entirely confined to canneries. Some firms are making definite efforts to market fully eviscerated and federally inspected poultry, and it is our impression that they are having considerable success in

marketing poultry under this method, since they continue to have large quantities prepared each year during the flush poultry season.

CAUSES FOR CONDEMNATIONS

To give you an idea of the quantity of poultry now being government-inspected in the United States, there were, during the year 1935, 23,268,441 pounds inspected, of which more than 500,000 pounds were condemned as unfit for food. The causes for condemnation were various, such as tuberculosis, septicemia, emaciation, decomposition, peritonitis, tumors, leukemia, abscesses and other conditions, but tuberculosis by far exceeds all other causes for rejection of poultry as unfit for food.

During the last year or two, there has been considerable activity in various sections of the country in preparing, especially for the New York market, kosher-dressed and government-inspected poultry. Such poultry, as well as any completely eviscerated poultry which is not to be processed and canned, must necessarily be solidly frozen and marketed in a frozen condition, unless of course, it is prepared for immediate consumption. There has been, and perhaps is, at present, in certain localities some prejudice against frozen foods of any kind; but with mostly all homes now being equipped with artificial refrigeration, the consuming public is becoming more and more educated to the fact that the freezing of foods does not in any way affect the purity or quality of foods in general, especially for such products as are seasonal and must be protected by refrigeration to carry them over from the season of plenty to the season of scarcity.

FROZEN POULTRY

The above points are mentioned to show that poultry is a seasonal product and must be produced in large quantities each year to supply the demand, and all poultry, whether eviscerated or not, is carried from season to season by freezing. Up until the last few years, there has been no fully eviscerated and inspected poultry prepared for the carry-over season, and even now only a small percentage of the millions of pounds consumed each year is being handled by this method. The common practice, after slaughter and plucking, is to grade the poultry for size and quality, pack it in boxes and send it to the freezer, where it is held for a favorable market. When the favorable market presents itself, it is removed from the warehouse and transported through various channels until it reaches the consumer. During this transportation, unless shipped under refrigeration, it reaches its

destination in a somewhat defrosted condition, depending on the length of the haul. If it is to be marketed to the home consumer through a retail store, the common practice of the retailer is to let the poultry entirely defrost, as it then presents a more normal appearance and is more easily drawn for the consumer. It is possible that in many instances birds are kept in a defrosted condition for several days prior to reaching the actual consumer. While being held in this condition chemical action and decomposition take place, with the formation of gases from the intestinal contents and food in the crop and gizzard, these gases permeating the flesh. Is it any wonder that such poultry may have a strong flavor when placed on the family table, to say nothing of the possibility of its being diseased, as well.

POULTRY SHOULD BE EVISCERATED

Poultry consumed in the home is as a rule eviscerated by the butcher, who is not educated to detect the lesions of disease, and therefore could not very well pass on its fitness for food, as far as disease is concerned. In many instances, the work of evisceration of poultry in the retail market is done on the same cutting-board or chopping-block where other meats are cut. There are usually considerable intestinal excreta and other fluids from the carcass smeared over the cutting-board, and if this filth is not immediately and thoroughly cleaned off, the next steak which is sliced off a loin of beef is likely to become contaminated to some extent. This practice indicates the desirability of poultry being delivered to the market fully eviscerated, after having been inspected, the same as other meat products. There, are, of course, sanitary meat markets where a special work-bench is provided for the handling of poultry.

Since the time of the feast of the Pilgrims, poultry has been looked upon as a food delicacy and in some homes is considered as a food luxury. This being the case, why should it not be inspected and handled in a manner fitting its delicate texture. As a matter of discussion we might be asked: "If poultry is to be handled in a manner similar to other meat food products, how would this affect the cost to the consumer?" The answer would be that the price per pound would necessarily be increased but the increased cost per unit bird should be very little, if any, for the reason that you would not be paying for inedible parts such as head, feet and viscera. Furthermore, the poultry packer who stores his poultry in a cold storage warehouse pays for such storage on a weight basis. Transportation companies and all carriers also charge for their services on a weight basis. There-

fore, the packers and other financially interested dealers should be in a position to hold their poultry to the carry-over season and deliver it at considerably less cost for these services.

Since there is approximately a 25 per cent shrinkage in the weight of an individual bird, by removal of head, foot and viscera, (This percentage of shrink will vary, of course, depending upon the grade, quality and species.) Thus it should be more economical to transport and store it fully drawn than to pay for the carry-over of the entire bird with all inedible parts, which is the present common practice.

PUBLIC SHOULD BE EDUCATED

If poultry is to be marketed as an inspected and fully drawn product, and it is our belief that the time is not far off when a large percentage of the yearly production will be handled by this method, the consuming public must, of necessity, be educated to the advantages of purchasing poultry in this condition. They would be placing on their table a sound healthy and more palatable bird, and one which could be prepared for the table in much less time, with considerable less mess in the kitchen, and generally satisfactory to the entire family. To those of you who have not had the opportunity of eating poultry which has been prepared in this manner, we would suggest that you inquire where such poultry is sold in your locality, and try it out, and be convinced as to the practicability of this method.

The poultry industry in this country is one of great importance. There are millions of pounds produced and consumed each year. The investment of producers runs into millions of dollars, and the consuming public pays millions of dollars yearly to place this delicacy on the family table, yet it is the one meat food product which is generally sold and accepted without having been previously and adequately inspected.

NO FEDERAL APPROPRIATION FOR POULTRY INSPECTION

At the present time, there is no governmental appropriation for poultry inspection, nor is such inspection service compulsory. The poultry canners and others who use this federal inspection do so at their own request and bear the entire expense of salaries of inspectors and all overhead expenses of the service. All monies are paid into a coöperative agency, which in turn acts as a depository and paymaster to the licensed federal inspectors on the certified payroll.

In conclusion, this Association and the veterinary profession in general are and naturally should be interested in promoting

whatever may be necessary in an educational program for the consuming public as to the advantages of inspected poultry. (Applause)

DISCUSSION

CHAIRMAN WESTMORLAND: Thank you, Dr. Jungherr.

DR. VAN ROEKEL: This is a very important paper. Those of you who are not intimately connected with poultry pathology probably do not realize the number of birds that go to market each year in very bad condition. You must remember that the killing which is done in the average poultry flock represents and includes a large majority of birds that are in very poor condition.

This is a very serious problem, and we should not ignore it. I would like to see this Association give more attention to the inspection of poultry carcasses that are used for human food consumption.

DR. A. J. DURANT: I would like to make a statement about the matter of tuberculosis. I know of one state in sections of which 90 per cent of the flocks are infected with tuberculosis, and the state itself, of course, has a great deal of that disease.

Confronted with a situation like that, it seems to me that you would be impressed with what Dr. Van Roekel has just said about the importance of poultry inspection. The disease has never been proven to be transmissible to man. Records show two cases in the United States, and those were diagnosed surgically, so that tuberculosis of fowl certainly is not very dangerous as far as the situation today is concerned. But if we are going to depend upon the historical teaching of some great preventive medicine men, all tuberculosis originated from one strain. If that is true, why wouldn't it be possible for the poultry strain suddenly to become pathogenic for man?

DR. L. M. HURT: I don't think there is any one class of live stock that is consumed, outside of cattle and hogs, which surpasses poultry used for the table. As we all know, this feature of meat preparation has not received much attention, either at our hands or at the hands of the medical profession.

It should be done not only from the standpoint of the danger we might encounter from a sick bird, but the mental effect that is reflected in the housewife's mind, when she get a bad bird, must be seriously considered. The same applies to a bad rabbit. They just don't buy another for a long, long time.

I have been surprised at the poultry and rabbit people themselves. They should get very actively organized in an energetic way to demand this service, because after all it is their pocket-book that is being affected. They should organize, and they should ask for local inspection of this kind. At the same time it will crystallize into an organized system of inspection some day, because it is such a big thing that it can't be neglected.

The matter of disease control in these things, and the transmission of these diseases to humans, I cannot vouch for. The disease end-products that develop in these birds which we may get and which we do get are no doubt due more to deductions and things of that kind than they are to actual diseases. From the standpoint of the soundest policy, it seems we should start propaganda in favor of general poultry and rabbit inspection, and those people who are in the business will be promoting their own ends financially if they will push this thing as rapidly as possible. (Applause)

DR. BEAUDETTE: I had the pleasure of hearing Dr. Durant's paper on tuberculosis at the A. V. M. A. meeting in Omaha last summer and

in that paper I noticed a statement that conveyed the impression that humans were not susceptible to avian tuberculosis.

I should like to have talked about that then. On the contrary, Klimmer, in Germany, has made a compilation of the cases of human infection of the avian type of tuberculosis, and has put on record 38 cases. So the disease is not entirely rare in human beings.

DR. C. P. FITCH: Mr. Chairman, it is somewhat of a wonder to me that this Association has not taken more cognizance of avian tuberculosis. Realizing, of course, that it is more or less a problem relating to a certain section of the country, namely, the North Central States, nevertheless it is a sufficient problem in those areas to merit the attention of the entire country. Surveys have been made, with which all of you are familiar, indicating that from 50 to 75 per cent of the flocks in that area are affected. Recent surveys in Minnesota indicated approximately 75 per cent.

Avian tuberculosis is not entirely innocuous for cattle. Not very long ago, a herd that had been accredited for twelve years in Minnesota suddenly showed seven reactors. These were slaughtered, and we demonstrated the avian type of the organism.

That is not an unusual situation; inspection of poultry is the only way by which this thing can be brought directly home to the producer. If you don't touch their pocket-books they are more or less unconscious of the losses which they are sustaining because of the price they receive for their product.

Again, let me call your attention to the condition that developed in Minnesota at the packing-plant where they were obliged to discontinue the purchase of poultry from Iowa and Minnesota. This is a problem which should be considered as a distinct part of the work of this Association. (Applause)

Mr. Chairman, would I be out of order to start this thing rolling? Would it be possible to have a committee appointed for the purpose of considering poultry inspection, and bringing in recommendations at the next meeting so that this can be broadcast and be acted upon as something definite to work upon?

If it will be in line, I should like to make a motion that such a committee be appointed, with instructions to report back at our next meeting.

CHAIRMAN WESTMORLAND: What size committee?

DR. HURT: A committee of five would be representative. I think the pioneers should be on that committee.

. . . The motion was seconded voted upon and carried unanimously. . . .

CHAIRMAN WESTMORLAND: Dr. Hurt, in that motion would you suggest that the incoming President appoint that committee along with the other committees?

DR. HURT: That is quite all right.

CHAIRMAN WESTMORLAND: Our next paper will be the report of the Committee on Transmissible Diseases of Poultry. Dr. George E. Corwin, of Connecticut, will present it. (Applause)

DR. CORWIN: I wish to take this opportunity to thank the members of the Committee for their valuable assistance in the preparation of this report. I am especially grateful to Dr. Jungherr and Dr. Martin, with whom I was able to meet and who were of great assistance in the preparation of this report. I also wish to express my gratitude to those who have taken part in this program, who have made it possible, and I am sure that they have done their part well.

. . . Dr. Corwin then presented the report. . . .

REPORT OF THE COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY

DR. GEORGE E. CORWIN, *Chairman*, Hartford, Conn.

Dr. B. A. Beach, Madison, Wis. Dr. E. P. Johnson, Blacksburg, Va.
Dr. J. R. Beach, Berkeley, Calif. Dr. Erwin Jungherr, Storrs, Conn.
Dr. E. L. Brunett, Ithaca, N. Y. Dr. C. L. Martin, Durham, N. H.

Last year, your Committee on Transmissible Diseases of Poultry rendered a report on the general importance of "poultry sanitation" in a broad interpretation of the word. It is the intent of the Committee this year to present for your approval a discussion of the newer problems in poultry diseases and point out the relation of these problems to the general aspects of disease control as exercised by the live stock sanitarian.

PULLORUM DISEASE

The necessity of, and the economic advantages from, a systematic control of pullorum disease by eradication based upon the elimination of reactors to serological tests, are so well known that they do not need recapitulation. In connection with the official eradication work, two problems have arisen which should be brought to the attention of this Association, namely, certain points in the sanitary provisions of the National Poultry Improvement Plan, and the testing for pullorum disease of species other than the common fowl.

The sanitary provisions dealing with the eradication of pullorum disease in the National Poultry Improvement Plan have been the subject of several revisions. The opinion of this Committee, supported by the Northeastern Conference of Laboratory Workers in Pullorum Disease Eradication, on certain points of this Plan, has been presented in a separate resolution. In further elaboration of this resolution, the Committee should like to state that it is of the opinion that the United States Pullorum-Tested class (less than 10 per cent reactors) should not be recognized, because it is contrary to the principles of sanitary control of live stock diseases to give recognition to infected herds or flocks.

Furthermore, the eggs from United States Pullorum-Tested flocks should not be allowed to be incubated, hatched or brooded on a farm or plant where United States Pullorum-Passed and United States Pullorum-Clean eggs are used, because experience has shown that transmission is likely to occur, even if only a small percentage of eggs is actually infected with the causative organism. An especially important point that is considered to be a severe let-down on the sanitary rules for the control of pullorum disease, under which excellent progress has been made in the New England States, is the provision which requires only an annual test of *all breeding birds* in the United States Pullorum-Clean class, while in the next lower class, the United States Pullorum-Passed class, an annual test of *all birds* in the flock is required.

This Committee is of the opinion that *all birds* of the proper age should be tested annually in both the United States Pullorum-Passed and the United States Pullorum-Clean classes, because it is not considered safe to let any birds go for more than a year without a serological test, especially when this infection is as prevalent as it is at the present time. The rules and regulations governing the control and eradication of pullorum disease should be as fool-proof as it is possible to make them. It is a steep climb for the flock-owner to go through the process of pullorum disease eradication; hence, this Association should do everything in its power to protect the unwary poultryman against any introduction of the disease after he has once

reached the goal of freedom from this almost universal poultry malady.

The second problem in pullorum disease eradication concerns the testing of species other than the common fowl. From a scientific standpoint, it has been shown that pullorum disease occurs in other avian species, such as turkeys, pheasants, grouse, bull-finch, canary, etc., but, except in isolated instances, there is no definite evidence that the disease becomes established in the adult bird and produces carriers, as is the case in the common barnyard fowl. Many of the disease outbreaks have been reported as due to incubator infections when eggs of other species have been incubated together with pullorum disease-infected chicken eggs. Certain commercial interests have demanded that other species of birds, especially turkeys and pheasants, be subjected to a blood-test for pullorum disease, but it is the opinion of the Committee that these requests are premature.

The Committee recommends, however, that work along this line should be carried on by qualified research agencies; it further recommends that, until it can be determined definitely that pullorum disease in other avian species does not become established, all other birds kept on the premises where fowl are tested for pullorum disease be included in the test. In this connection it should be pointed out that the term "disease-free breeding turkeys" may be interpreted by laymen as freedom from diseases in general, as, for example, paratyphoid, erysipelas, fowl cholera and fowl typhoid, which seem to be more important in turkeys than pullorum disease, on account of their highly contagious and infectious nature and because some of these diseases may be transmitted through the egg. There is no evidence that sufficient cross-agglutination occurs between the pullorum and paratyphoid organisms to allow one to recognize reactors to paratyphoid by an ordinary agglutination test for pullorum disease, although it would be possible in the case of fowl typhoid.

RESPIRATORY DISEASES

This Committee wishes to call attention to the new definition and nomenclature of the respiratory diseases proposed by the Special Committee on Poultry Diseases of the American Veterinary Medical Association at its annual meeting in 1936.* Although this Committee concedes that the term infectious bronchitis for a new virus disease immunologically distinct from laryngotracheitis is somewhat confusing, since it is identical with the older term for laryngotracheitis, it wishes to stress the importance of adhering to the new nomenclature in order to clarify the concept of respiratory diseases as much as possible.

The term "roup" should be completely abandoned as having no definite meaning. In states where rules and regulations for the control of all or only certain respiratory diseases of poultry are in force now or contemplated in the future, it is necessary that sanitary officials become familiar with the cause and control of these diseases. However, the difficulties in establishing a correct diagnosis should be recognized, since atypical cases of various diseases present a similar symptomatology. The accurate recognition of respiratory diseases, is essentially a laboratory procedure; it is recommended, therefore, that sanitary officials in every state make provisions for, or arrangements with, a laboratory in which the proper diagnostic facilities are available.

In this connection the Committee wishes to recognize the effectiveness of laryngotracheitis vaccine from both the prophylactic and emergency standpoints. On the other hand, the Committee subscribes to the dictum that eradication of the disease is preferable, because it elimi-

*Report of the Special Committee on Poultry Diseases, Jour. A.V.M.A., lxxxix (1936), n. s. 42 (4), pp. 449-450.

nates the focus of infection. Although experimental work seems to indicate that prophylactic vaccination for laryngotracheitis does not produce carriers, this cannot be accepted as an unequivocal fact, especially if vaccination is practiced by an untrained personnel. It appears to the Committee necessary, therefore, that state sanitary officials exert control and jurisdiction over the use and sale of laryngotracheitis vaccine of both commercial and autogenous origin, and that they condemn most severely the practice of promiscuous vaccination without establishment of a proper diagnosis by a competent authority. It is recognized that the attitude of the sanitary officials must vary according to the state or region, since the prevalence and spread of the disease varies considerably in states having a predominating commercial poultry population and in those having a predominating exporting poultry business.

The diagnosis of infectious bronchitis becomes of importance in states where laryngotracheitis is a reportable disease, since infectious bronchitis may occur especially in baby chicks and can apparently be spread by hatcheries. It is the opinion of the Committee that a temporary quarantine of hatcheries in which the disease has been definitely established would be in the interest of the poultry industry of the state, since no effective control measures are known, aside from sanitary measures.

The differential diagnosis of coryza from the fore-mentioned virus diseases depends primarily upon the laboratory isolation and identification of the causative organism, *Hemophilus gallinarum*. In general, bacteriological examination even of suspected virus diseases appears to be necessary, because secondary invaders such as *Shigella nasalis*, reported by Erwin, Delaplane and Stuart,* seem to be capable of bringing about a severe reaction when inoculated into the cloaca. Since such organisms may cause pathogenic alterations subsequent to cloacal inoculations, it is advisable to discourage the indiscriminate use of autogenous vaccines without previously obtaining a diagnosis.

The chronic forms of fowl cholera may likewise parade under the innocent form of a "cold" or some other respiratory disease; autogenous vaccination by the cloacal route with exudate containing the fowl cholera organism could lead to epizootic losses from this disease.

NUTRITIONAL DISEASES

Great advances have been made in the scientific analysis of the nutritional requirements of poultry, but a large field has yet to be covered before the ideal, all-around feeding method is evolved. From the standpoint of the live stock sanitarian, one much be concerned primarily with the differential diagnosis of nutritional diseases which could simulate a disease of infectious origin. For the proper recognition of a disease, it is obviously necessary to eliminate nutritional factors, as far as possible, by proper laboratory methods. This problem has come to the fore-front especially in connection with a chick disease known as "epidemic tremor," which is characterized by either fine tremors of the head and neck, lameness in the legs, or both, and which is practically indistinguishable, unless accompanied by the characteristic tremor, from nutritional paralysis due to deficiency of a component of vitamin G. In fairness to both the feed manufacturer and the hatchery, the diagnosis of epidemic tremor should be based upon the histological demonstration of the specific lesions in the central nervous system. A similar relation exists between vitamin-A deficiency, formerly known as "nutritional roup," and the complex of diseases which is grouped under the term "respiratory diseases."

**Shigella Nasalis* Sp. Nov., a Secondary Invader of the Nasal Passages of Chickens, Jour. A.V.M.A., xci (1937), n. s. 44 (3), pp. 317-322.

ADULT MORTALITY PROBLEM

Mortality due to acute infectious and contagious diseases has materially decreased during the last few years, probably on account of improvements in the diagnostic recognition of diseases, better enforcement of control measures on the part of the live stock sanitarian and, last but not least, on account of a better conception prevailing among average poultrymen, of the nature of infection and the carrier state. On the other hand, no actual decrease in total mortality has occurred and, according to some investigators, a definite increase in adult poultry mortality has been registered the country over. This state of affairs has caused considerable alarm among the leaders of the poultry industry and warrants further intensive study of the entire mortality problem by all scientific and control agencies concerned.

The mortality problem is distinguished by its complexity; factors not only of heredity and management, but also of nutrition and disease, enter the picture.

Although concrete attempts at disease control by breeding for disease resistance are interesting and valuable, it must be stated that the principal efforts along this line have been directed toward the control of pullorum disease and fowl typhoid, diseases for which highly effective and workable control measures have been demonstrated and put into force. It seems to the Committee that such efforts should be directed toward the control of diseases in which hereditary susceptibility seems to play an important rôle and for which orthodox sanitary control measures alone appear to be insufficient. The Committee has especially in mind the "tumor complex" in fowl, to which further reference will be made below.

The influence of management upon the problem of adult poultry mortality is appreciated by all experienced poultry-breeders. In essence, good management should be the practical adaptation of the scientific principles which are derived from sound experimental observations.

In regard to the influence of nutrition upon adult poultry mortality, the Committee believes that the advances in the recognition and isolation of essential protective food substances may open up a new source of danger to the health and life of adult poultry. Practices of processing and extracting vital elements from natural ingredients used in poultry rations, for example, the extraction of wheat germ from wheat or of flavin from skim milk products, may lead to hitherto unexpected nutritional disorders. Obviously such deficiencies in protective factors cannot be ascertained by ordinary official feed analyses, and it is the opinion of the Committee that the use of such processed materials should be clearly stated on the label for the protection of the poultryman.

The composite opinion of poultry disease investigators and the available records on adult mortality seem to indicate that diseases which may be characterized briefly as falling under the heading "tumor complex" play an important part in the causation of adult poultry mortality. Although a diversity of opinion exists as to what the tumor complex should comprise, it seems fairly well established that neurolymphomatosis, lymphomatosis and leukosis are definitely included. Other conditions such as asthenia (going light), certain forms of internal hemorrhage, or abnormalities of the egg-laying apparatus may fall into this group. Quite frequently gross pathological and bacteriological examinations fail to reveal the essential underlying conditions and it is necessary to resort to histological study of the cases. From the standpoint of the live stock sanitarian, it should be kept in mind that the results of certain studies, however limited and inconclusive, have suggested that various forms of these diseases of the tumor com-

plex are essentially of a chronic, infectious and contagious nature, and therefore should fall under the control agencies represented by this Association. Hence, it is suggested and recommended that further studies along this line be sponsored by this organization and that ways and means be provided for conducting these studies on an adequate and extensive scale.

SUMMARY

In summarizing this report the Committee believes that, in the face of the rapid development of the poultry industry, which is accompanied by increased productive demands of the birds and recession from natural feeding and management practices, new disease problems will arise continuously which have to be investigated by students in the fields of heredity, nutrition and pathology, and that a successful solution of these problems depends upon intelligent coöperation among the scientific groups concerned.

The Committee further believes that live stock sanitary officials and the members of the veterinary profession at large should keep themselves well informed on the new developments in the field of poultry diseases and thereby ascertain their rightful place, which is too often invaded by unqualified agencies. (Applause)

DR. CORWIN (continuing): I move the adoption of this report, with the recommendation that it be referred to the Executive Committee.

DR. JUNGHER: I second the motion.

DR. VAN ROEKEL: Did I understand that you could not detect reactors with the pullorum antigen? I should like to mention one case we encountered:

A flock had been negative to pullorum disease for a number of years. Paratyphoid broke out in the chicks, reactors were detected with pullorum antigen, and the organism was isolated. So there is cross-agglutination with the pullorum antigen.

DR. JUNGHER: Under certain conditions it is possible to obtain cross-agglutination between paratyphoid and pullorum reactors. However, these cross-agglutinations depend entirely upon the type of paratyphoid organism involved. Some of you are familiar with the fact that there are in the neighborhood of 35 or 36 biologically different types of paratyphoid organisms; some of them very definitely cross-agglutinate and others do not. The general statement should hold true that paratyphoid and pullorum antigens are not sufficient for detecting the various reactors, but under certain conditions it is possible.

. . . The motion to accept the report was voted upon and carried unanimously. . . .

CHAIRMAN WESTMORLAND: The next paper is the report of the Committee on Parasitic Diseases. It will be read by Dr. Benjamin Schwartz, Chairman. (Applause)

. . . Dr. Schwartz read the report. . . .

REPORT OF THE COMMITTEE ON PARASITIC DISEASES

DR. BENJAMIN SCHWARTZ, *Chairman*, Washington, D. C.

Dr. B. T. Simms, Corvallis, Ore.

Dr. T. W. M. Cameron, Montreal,

Dr. Hadleigh Marsh, Bozeman,
Mont.

Can.
Dr. James E. Ackert, Manhattan,
Kan.

Following the plan of the report of last year the Committee desires to call the attention of the Association to several specific parasites

and parasitic diseases. The report which follows should not be regarded, therefore, as a complete résumé of the work in parasitology that has come into prominence since the report of 1936 was submitted. The report this year covers only a few of the more important problems in parasitology, and the Committee regards these problems as of special interest to the membership of this Association.

PARASITES OF SHEEP IN THE NORTHWEST

In the field of nematode parasites of sheep, so much emphasis has been placed by parasitologists on the importance of the eastern stomach worm, *Haemonchus contortus*, that the pathogenic effect of other trichostrongyles has been too greatly minimized. In the northwestern states, *Haemonchus contortus* is found infrequently as a parasite of native range sheep. Sheep in that area harbor *Ostertagia*, *Nematodirus* and *Trichostrongylus*. Observations over a period of 20 years in Montana indicate that of all the intestinal nematodes of sheep the most severe pathogenic effect is produced by *Nematodirus*, which, in the past, has been generally considered to be of minor importance. Control work on sheep parasites should include recognition of the importance of this worm.

In Oregon the eastern stomach worm and the hookworm have been found in sheep since 1928, nearly always in flocks that have been shipped into the state or in native sheep that had been exhibited in the Middle West.

Recent work has shown that in the areas in which liver fluke exists, severe losses among sheep occur which are not directly due to liver fluke infestation, but are the result of bacterial activity, secondary to fluke infestation, the bacteria producing what has been described in Australia as "black disease." The death of sheep in such cases is produced by a powerful toxin elaborated by *Clostridium edematiens* in fluke-infested livers. Since complete eradication of flukes by snail destruction will not be accomplished in the near future, it is important to know that sheep can be protected against the effect of *C. edematiens* toxin by a vaccine which has been developed in Australia and in Montana.

In the field of protozoan parasites, coccidiosis is a cattle disease of major importance in the northwestern states. The results of recent investigations indicate that several species of coccidia may be considered as normal inhabitants of the intestine of cattle, and that an outbreak of coccidiosis need not be related necessarily to any specific source of infection in the immediate environment of the affected host animals. Clinical coccidiosis apparently develops as the result of a lowered resistance of the intestinal epithelium to the multiplication and subsequent invasion of epithelial cells by coccidia already present in small numbers. It is believed that prevention of coccidiosis can be accomplished by managing young cattle so as to prevent intestinal disturbances and maintaining the general vigor and resistance at a high level.

TRICHOMONIASIS IN CATTLE

Although Mazzanti reported in 1900 what appeared to be an association of trichomonads, *Trichomonas foetus*, with a genital disease of cows and heifers that were slaughtered on account of permanent sterility, no further reference to this condition appeared until 1925. Since 1925, a genital disease of cattle, associated with trichomonads, has been a subject of discussion in veterinary literature. Abelein (1929) was the first investigator who conducted large-scale field investigations of this disease and he definitely associated *Trichomonas* with the clinical entity that is commonly referred to as venereal

trichomoniasis in cattle. Following Abelein's extensive reports on trichomoniasis, published in 1930 and 1932, numerous papers reporting various aspects of this disease have appeared in the veterinary literature of the world.

Genital trichomoniasis of bovines is known to exist in Austria, England, France, Germany, Italy, Japan, Yugoslavia, Roumania, Switzerland and the United States. The consensus among investigators who have studied bovine trichomoniasis is that this infection is a common cause of sterility and early abortion in cows and heifers. One investigator reported that *Trichomonas foetus* was responsible for nearly 40 per cent of all cases of sterility in cattle that were investigated in a veterinary clinic in Germany. When abortions do occur, they take place early during pregnancy, all such abortions apparently occurring before six months, and most occurring during the second and third months of pregnancy. As an illustration of the serious nature of bovine trichomoniasis, the following facts, given by Abelein, are cited. In an infected herd, in which no cause of sterility other than *T. foetus* could be found, the number of pregnant cows dropped from 96 to 24 per cent of the herd; of the cows that failed to calve, metritis, early abortion or pyometra appeared to be the causes of sterility.

Investigations in progress in the Zoölogical Division of the Bureau of Animal Industry at the National Agricultural Research Center, Beltsville, Md., have shown conclusively that the inoculations into the vaginas of heifers of *T. foetus*, maintained for months in artificial culture with frequent subinoculations into fresh media, were capable of inhibiting the estrous cycle for long periods. Bulls became infected as a result of serving artificially inoculated heifers: such infected bulls transmitted the organism to clean heifers as a result of coitus.

The Bureau of Animal Industry, in addition to its basic research, on the causative organism and its relation to sterility and early abortion, is endeavoring to ascertain the prevalence of *Trichomonas* infection in dairy herds and to determine the geographical distribution in the United States of the causative organism. A method of obtaining samples under field conditions for examination in a central laboratory has been devised, and a set of instructions covering this procedure will be sent to any qualified veterinarian on request.

PARASITES OF WILD ANIMALS

While professional parasitologists have studied the parasites of wild animals for many decades, this subject has sprung into prominence only within the past few years. There are several reasons for this. In the first place, many parasites of wild animals have been found to carry disease to man and domestic animals or to parasitize them. Secondly, a considerable number of fur-bearers are now kept in captivity, and a study of their parasites has been of great importance. Third, the conservation of wild life and the study of animal cycles has done much to focus attention on this subject.

Our stock was originally introduced from the Old World, and it follows, therefore, that all parasites found in them in the Western Hemisphere, that are not also found elsewhere, must have come from our wild animals. Assuming that parasites have not evolved as quickly as their hosts, it is probable that most of the parasites of stock came from related groups of hosts, that is, parasites of cattle, sheep and goats came from wild ruminants, those of dogs and cats came from wild carnivores, those of domestic poultry came from related wild birds, and so on. In some cases parasites which, presumably, originated in the Western Hemisphere are also now found in Europe, as for example, gapeworms of poultry and game birds, which originally came from turkeys. These parasites were exported in these birds to Europe.

Among the trematodes, the most important American form is *Fascioloides magna*, the life history of which has been satisfactorily elucidated recently by Swales and Krull; its comparative pathology and epizootology have been studied in detail. Its life cycle is similar to that of *Fasciola hepatica*. This fluke appears to be essentially a parasite of deer and only accidentally infects bovines and sheep. In bovines, the host's cellular reaction is so extensive that the fluke apparently cannot complete its life history; in sheep the infection is frequently so acute that these host animals succumb to the infestation. However, in less acute infestations in sheep, eggs are eliminated in the feces, making possible a completion of the life cycle. This fluke must be regarded as primarily a parasite of deer. The known distribution of *F. magna* is from the Atlantic Coast to the Pacific, both in the United States and Canada.

Swimmers' itch or schistosoma dermatitis is a human disease caused by the penetration of the skin by the cercariae of certain blood flukes of wild animals. This dermatitis is widespread in North America and, while irritating, it is not serious; the cercariae, after penetrating the human skin, do not develop further. Although not reported as an animal disease, it is possible that these cercariae may attack any domestic animals entering infested water.

The fringed tapeworm, *Thysanosoma actinioides*, is another species of importance in ruminants which is peculiar to America. So far, the only wild hosts appear to be deer and these may have been the original source of infection.

Tetrameres crami, a spirurid parasite of ducks, both wild and domestic, is quite common, and Swales has shown that it is carried by two amphipods, *Hyalella knickerbockeri* and *Gammarus fasciatus*. This parasite lives in the proventriculus of the birds and may be pathogenic. It appears to be carried to domestic ducks by the first-mentioned species of amphipod and to wild ducks by the second.

Two serious diseases of man in North America, plague and Rocky Mountain spotted fever, are diseases of wild rodents which are transmitted to man by biting arthropods, while tularemia, a third disease of rodents, mainly carried to man by contact, may also be transmitted by biting insects.

Among species imported into America from Europe, which have now become established in wild hosts, are the common liver fluke *Fasciola hepatica* in deer, the broad tapeworm, *Diphyllbothrium latum* of man and carnivores, in bears and other wild carnivores; the hydatid cyst in moose, and the other tapeworms having their larval or cyst stages in wild ruminants and rodents, and their adult stages in wild carnivores; the common stomach worms of ruminants *Haemonchus contortus*, and *Ostertagia circumcincta* in wild ruminants, and doubtless many others.

Trichostrongylus tenuis, one of the causes of European grouse disease, is now known to be present in a number of our wild birds; it was probably introduced in game birds from the Old World. *Tetrameres americana*, *Chilospirura spinosa* and *Dispharynx spiralis* are other parasites of game birds of at least potential importance, which are probably of local origin.

Several parasites of fish have been investigated and two larval forms, which are common in the musculature and skin of bass and other game fish in eastern North America, have been shown to occur as adults in fish-eating birds. A third, common in Tulebee and Cisco in the Middle West, is the larval stage of a cestode of pike and other carnivorous fishes. All three are visible to the naked eye and have caused much uneasiness to food inspectors; none, however, parasitizes man.

A large number of parasitic worms have been recorded from fur-bearing animals but, in most cases, the records have been limited to descriptions of the worms. Several of these animals have been shown to acquire infestation through ingestion of fish. The bionomics of most of the others is unknown, except for some of the worms in the silver fox.

Systematic surveys of the parasites of wildlife have been commenced in several sections of the United States and in Canada but considerably more attention should be paid to this most important subject than has been done in the past. Research on these parasites is only just beginning and this field is full of opportunity for the veterinarian.

TRICHINOSIS

It was the Committee's intention to present a report on trichinosis in swine and its bearing on human health. Since the chairman of this Committee has accepted an invitation to present a paper on trichinosis before this Association, a discussion of this topic has been omitted from this report. The Committee endorses the recommendations on the control of trichina infection in swine and human beings, as outlined by the Chairman in the paper that has been read, and suggests that live stock sanitary officials be guided by these recommendations.

CHAIRMAN WESTMORLAND: Thank you, Dr. Schwartz.

DR. SCHWARTZ: I move the adoption of this report.

DR. CAMERON: I second the motion.

CHAIRMAN WESTMORLAND: As this report has not come before the Executive Committee, we will refer it to that body and shall vote on it during the afternoon session.

The next report will be that of the Committee on Miscellaneous Transmissible Diseases. Dr. A. W. Miller will present it.

. . . Dr. Miller read the report. . . .

REPORT OF THE COMMITTEE ON MISCELLANEOUS TRANSMISSIBLE DISEASES

DR. A. W. MILLER, *Chairman*, Washington, D. C.

Dr. E. A. Watson, Hull, Can.

Dr. F. A. Zimmer, Columbus, Ohio

Dr. Edward Records, Reno, Nev.

Dr. Jacob Traum, Berkeley, Calif.

Your Committee's report this year deals with infectious equine encephalomyelitis, anthrax, and a brief reference to the foot-and-mouth disease situation in foreign countries.

INFECTIOUS EQUINE ENCEPHALOMYELITIS

Extensive outbreaks of this disease occurred in various parts of the country although its incidence was greatest in states west of the Mississippi, serious outbreaks occurring in Minnesota, the Dakotas, Iowa, Nebraska, Colorado, Kansas, Missouri, Oklahoma, Arkansas and Texas, and lesser outbreaks were reported from California, Idaho, Washington, Oregon, Montana, Wyoming, Nevada, Utah and New Mexico. Some infection was reported in Louisiana and Mississippi, and in the East the disease appeared in the same general area that has been involved in previous years, *i. e.*, along the Atlantic Coast from New Jersey to Florida, sporadic cases and minor outbreaks occurring in New Jersey, Delaware, Virginia, Maryland, North Carolina, South Carolina, Georgia and Florida. The disease was positively identified

in South Carolina and Georgia for the first time by the actual recovery of virus from cases in those states. This virus was of the eastern type. Examination of a considerable number of specimens from Florida revealed pathological alterations similar to those of the virus disease but the actual virus was not recovered.

The disease made its appearance in the more northern states west of the Mississippi in July, reached its peak in late August, and subsided by late September. Farther south, infection began a week or more later and persisted until the middle of October to early November. Thus, in Oklahoma and Arkansas, early cases were observed in late August and early September and the last cases were seen about the middle of October. In Texas there were still scattered cases occurring in November. In the East, most of the cases occurred in August and September. The earliest positive cases appeared in Florida in the month of May, and as in former years no cases, or very few, occurred in the East after the first frost or after cooler weather had set in. In this year's outbreak in the Middle West, the case incidence was higher than in any previous year. Complete data are not yet available but it is estimated that there were more than 100,000 cases of the disease, with a mortality of about 30 per cent.

Preventive measures based on the assumption that the natural disease is transmitted by biting insects gave good results during this year's outbreak. It was found that in a number of large groups of horse stock, particularly in those at some of the Army posts where the animals were kept stabled at night and other measures were taken to protect them from blood-sucking insects, very few cases occurred. On the other hand, in the same general vicinity, horses that pastured showed a relatively high case incidence.

Although anti-encephalomyelitis serum and vaccine were used extensively in the prevention of the disease, an evaluation of the efficacy of the products cannot be made until reports from the field are available for study, except that we do have some information on this phase as a result of experimental immunization work that was carried on in Nevada, Doctor Records, who is a member of this Committee, reporting as follows:

"In Nevada experimental immunization work was continued in the field using live virus alone and in combination with antiserum. Approximately 250 horses were treated with small doses of guinea pig fixed virus alone. The results were satisfactory as far as the production of immunity was concerned, no clinical cases developing after 15 days subsequent to treatment.

"Complications were encountered in some horses injected after the middle of June. Some of these animals developed acute clinical cases in from four to twelve days following injection. The trouble in these instances, on more careful investigation, appeared to be due to superimposing the virus injection on a subclinical natural infection or a severe exposure which was not recognized at the time. It would seem clear in the light of this experience that the virus-alone method of immunization should not be used later than about six weeks prior to the date when the first natural cases may be expected in a given area.

"Approximately 875 horses were injected with the same virus and from 40 to 75 cc of antiserum simultaneously. In spite of the fact that most of this group were treated after the disease became active and were under severe exposure to natural infection, no clinical cases developed later than 48 hours after injection, and the few which developed during this brief period were mild with no deaths.

"A consideration of these results seems to indicate rather clearly that of these two methods of immunization the simultaneous injec-

tion of serum and virus is much to be preferred for routine use in the field. The slight additional expense for the small dose of antiserum required is more than offset by the additional safety factor. The use of the live-virus-alone method would certainly not seem warranted where there is any danger of simultaneous natural exposure by reason of the season of the year or otherwise."

ANTHRAX

Anthrax in a virulent form again swept over the southeastern section of South Dakota and several counties in the northeastern part of Nebraska, during the past summer. In the former state, the disease appeared on more than 1,000 premises located in 46 counties. Previous outbreaks of similar character occurred in this state in 1926 and in 1932.

A number of deaths occurred in several counties in the southeastern section of South Dakota before state and federal authorities were notified and a diagnosis of anthrax was made. There is little doubt that most of these deaths were due to anthrax and that improper disposition was made of many of the carcasses. In some instances where the animals had been skinned to salvage the hide, anthrax developed in persons who were connected with the skinning and handling of the carcasses. From the start, therefore, state and federal authorities were confronted with an outbreak of this disease of a highly virulent character, with widely scattered centers of infection, where opportunity for further spread by flies, dogs and carrion-eating birds was afforded through improper disposal of carcasses.

To meet this emergency the federal Bureau of Animal Industry detailed more than 50 veterinarians to cooperate with the state officials and practicing veterinarians in bringing the disease under control. Premises where infection developed were placed under quarantine, proper attention was given to the disposal of carcasses by cremation, and vaccination of all exposed cattle was recommended to owners.

Although some losses from anthrax occur in this area each year and almost every stockman knows that in certain years the disease breaks out in virulent form and causes heavy losses, no general program of annual vaccination has so far been inaugurated in anticipation of these cyclic waves that have in the past made their appearance at intervals of from four to six years. However, as a measure of preparedness for these waves of virulent anthrax, the federal Bureau of Animal Industry, in cooperation with the Office of Indian Affairs, in 1933 inaugurated such a program of annual vaccination of all Indian-owned cattle in the Cheyenne, Crow Creek, Lower Brule, and Rosebud Indian reservations in South Dakota. This program has been continued each year and the indications are that it is effective, as no losses from anthrax have occurred in the four years that the program has been in effect, including the past year, when the disease occurred in virulent form.

As it has been repeatedly observed that cattle do not respond as well to anthrax vaccination during these virulent outbreaks as they do when vaccinated well in advance of the anthrax season, it is the recommendation of your Committee that in anthrax districts annual vaccination be performed in the early spring as the best means of safeguarding the live stock against the ravages of this destructive disease.

FOOT-AND-MOUTH DISEASE

Following a period when foot-and-mouth disease existed to a slight extent only in central and northern European countries, the past six months have witnessed a tremendous spread in several of these countries, notably France and Germany.

In France, the report for the last half of September shows 12,943 new premises infected, scattered in 1,461 communes and in 81 of some 95 departments in the country. In Germany, 2,430 infected farms are reported for the last half of October. From no outbreaks reported in the Netherlands during June, the disease increased to 394 reported outbreaks in August. Belgium was free for several months up to July, but in September the disease was reported to be prevalent. After being entirely free for more than two years, Switzerland became reinfected a few weeks ago. Great Britain was entirely free during April and May but, beginning June 7, has had a series of outbreaks up to the present time.

In connection with the most recent outbreaks in Great Britain, a press dispatch from London, England, on November 13, gives an interesting sidelight on the conditions in that country. That dispatch reads as follows:

"Sir Percy Hurd, conservative, expressed the country's concern over the current epidemic of hoof-and-mouth disease today by preparing a question which will be answered on Monday by William Morrison, minister of agriculture. The question reads: 'What further measures will be taken to avert hoof-and-mouth disease, especially in view of the evidence which shows the major sources of infection are marrow bones from Argentina meat, rinds from Polish and other eastern European bacon and other raw material products from countries infected with the disease.'"

That there is some question in that country concerning the efficacy of the serum that is used quite extensively in Germany in combatting foot-and-mouth disease is indicated in another recent report which reads as follows:

"The ministry of agriculture is waging war night and day against the epidemic in Britain by destroying animals, in view of the lack of faith in the serum used in Germany. The ministry said its Aftosa research committee reported: 'Such serum as is available at present cannot be relied upon to protect bovines from infection when intimately exposed to highly infective cases of the disease.'"

The United States as well as our neighbors on the North and South, the Dominion of Canada and the Republic of Mexico, has continued to remain free from this highly infectious disease. (Applause)

DR. MILLER (continuing): Mr. Chairman, I move the adoption of this report.

DR. JUNGHER: I second the motion.

. . . President Smith resumed the chair. . . .

DR. THOMAS ARNOLD: With reference to Dr. Miller's report regarding the serious outbreak of anthrax that we had in South Dakota last summer, there was considerable vaccination that was carried on there in that state, and a Parke Davis product was used which, we have reason to believe or think, caused a good deal of anthrax. We feel that we had somewhere in the neighborhood of 500 outbreaks from this vaccine.

Dr. Anderson, our State Veterinarian, gave Dr. Fauks some of these pellets and asked him to send them to the Bureau for investigation. I am wondering what the results of that investigation were. We never heard anything further and I am wondering if Dr. Miller can inform us.

DR. MILLER: Several of those samples of pellets were sent into Washington. As I recall it, we made a report on the testing of those pellets within the last week, and in every test that we ran the pellets

conformed to standard, so we are somewhat at a loss as to the situation you had in your state.

DR. ARNOLD: What experiments were made?

DR. H. W. SCHOENING: I might say that we made quite an extensive test of quite a number of the products which were under suspicion in South Dakota, and which were causing breaks following their use. We had samples from premises where they had actually been used and were incriminated as being responsible for the trouble. These products were cultured, they were inoculated into guinea pigs, and they were also inoculated into cattle. In all instances in our culture work, in our animal inoculation, that is, in rabbits and guinea pigs, they conformed to the type of spore known as a Number 2.

This product is capable of producing death in guinea pigs, but not in rabbits. This was consistently so in all of the samples that were subjected to tests. In addition, the pellets themselves were injected into guinea pigs and also into rabbits, with the result that the rabbits lived and some of the guinea pigs died.

I might say that the indications were that these strains were really a weak Number 2. Eleven cattle were injected with pellets. Each animal received one pellet, and the animals were kept under observation over two months, and at no time did these animals show any elevation in temperature or even swelling at the site of inoculation.

The reactions following the use of these products in the field were quite suggestive that they might be responsible for the disease. But it is well known that, in virulent outbreaks, such as existed in South Dakota in 1932, any biological product used in herds that are exposed or in the general area, in such an epizootic as swept over South Dakota and parts of Nebraska, may respond very unfavorably when used for vaccination.

Just what the explanation of this is is difficult of interpretation, but it has been recognized as one of the unknown factors in the so-called anthrax vaccination. It has been observed in other parts of the world, and a variety of explanations have been given, but none of them has been entirely satisfactory.

While we have known of anthrax and anthrax immunization for many years, there are still points in connection with vaccination, the immunology and infection of the disease in these so-called virulent outbreaks that occur only in certain areas at certain times under certain conditions, that really need investigation before we are able to say definitely what the losses might be due to.

It is believed, however, that in those areas that are subjected to these epizootic waves, very probably, annual vaccination, well in advance of the time when anthrax might be expected to appear, would be a means of controlling or, at least, reducing the losses occasioned by these outbreaks.

The usual practice following a severe epizootic is to vaccinate in advance of the anthrax season the following year. Quite frequently it is the case that the year following a severe outbreak the losses are perhaps below normal. In these anthrax districts the infection appears every year, perhaps to a greater or lesser extent; but in these intervals of five or six years the losses become extremely high. We have an explosive type of disease which appears simultaneously in a number of areas within a comparatively short time, and in new territory that is not ordinarily considered to be the so-called anthrax district. But it is believed that, if vaccination were practiced every year in those areas, an immune population would be built up so that when the condition became right for these so-called explosive outbreaks that would occur in those districts at various times, they would find conditions detrimental to their occurrence, as the resistance of the population

would be built up to such an extent that the losses would be small as compared with what ordinarily would happen were the population susceptible to the disease.

I would like to emphasize the recommendation made by the Committee, that in these districts where the losses do occur, annual vaccination well in advance of the season be performed by the veterinarian. I think that is a very important point, namely, that anthrax vaccination is more than simply injecting a product under the skin. It requires a knowledge of the various local conditions in the different herds. What might be applicable in one herd might not be applicable in another, depending upon conditions; so, the procedure of vaccination is a highly technical one and should be undertaken only by the veterinarian, and not used indiscriminately as is done in some cases.

DR. ARNOLD: Just what was this product you used? Can you tell me whether or not the product Dr. Fauks sent in was examined? We can trace about 500 breaks to this particular product. While I think probably all of the products were used in South Dakota, the Parke Davis product is the only one that we can trace breaks to, and I think we can trace about 500 breaks to that product.

The expiration date of that product was 1940, and that seemed to be the particular date of the product we had the trouble with. We feel—and the people in South Dakota feel—that that product caused a lot of disease in our state.

DR. MILLER: Dr. Arnold, I signed the letters that went out, and I think I can answer that question. One of the samples of the Parke Davis product that were sent in by a druggist who sold the product in the neighborhood (I am speaking from memory) was used on five herds in that vicinity. One herd broke, and broke badly. A large percentage of the animals died. In the four other herds no infection developed.

Those tests, as Dr. Schoening said, were run with the pellets from that drug store. Our letter went to that drug store, and I assume (although I promised Dr. Anderson I will look it up in Washington) that copies were sent to your office. Other samples were sent in, and although I would like to have Dr. Schoening's confirmation on this, they were all Parke Davis pellets.

DR. SCHOENING: That is right. I don't know the serial number of the products, but the expiration date was 1940.

DR. C. E. COTTON: We had some experience with Parke Davis products late in August of this year. As I recall it, we determined immediately, when those products were sold, that they were sold by the druggist directly to nine farmers, I believe. Within 24 hours, we knew of those sales and we immediately quarantined the cattle on all of those nine farms. Within seven days, anthrax appeared, I believe, on six or seven of the farms, and as it appeared it did not act as Dr. Schoening reports it did in the eleven cases he watched.

In every case the temperatures were higher. We had very decided local swellings. We found that the animals which carried temperatures did not give results as quickly as we have secured with one dose of bovine serum in some of the other grades, but we did succeed in saving practically all of the animals with the serum.

However, the fact remains that we are satisfied that the break was due to the product, because we did not have any anthrax in that immediate vicinity except on farms of those who used that pellet. In the laboratory, the second series of pigs which were inoculated got the disease.

DR. SCHOENING: Perhaps I might give a little more detailed statement of some of the work we did. In one particular case we had a swab sample from an animal that died following the use of the vaccine.

We also had the pellets that were used in vaccinating the herd. The swab sample contained anthrax organisms which, according to laboratory tests, possessed the virulent characteristics of a field strain of anthrax. That is, it would kill rabbits and guinea pigs in 100 per cent of the cases, whereas the pellets that were used on this particular place were the laboratory strain in all instances.

They produced death in guinea pigs but not in rabbits. I would like to point out this difference in the cattle inoculations that were performed by the Bureau:

They were the sample pellets that were used in South Dakota, the only difference being that the animals were in a different territory. I believe that is the probable explanation of the difference in results, that you can inoculate the biologics outside of this so-called epizootic area and everything will go along normally as you expect. But when you get into this other zone, where this virulent type of the disease is present, the results might be different.

I was in South Dakota in 1932, when they had a similar outbreak to the one which appeared this past season, and I had an entirely different conception of anthrax immunization after I left the area than I had had before. I do not recall visiting any places at that time where pellets were used, but in areas where some of the other products were used, the losses following vaccination seemed to be out of proportion to what they should have been. The same history prevailed as appeared in this particular epizootic, that no anthrax appeared on the particular farm, although it was in the general area, and it was the same type of infection that existed the other time, and vaccination was performed with various products. Following that some animals would die of anthrax.

I think vaccination probably has something to do with the cause of these losses, but they are not directly due to the vaccine itself but due to a combination of circumstances. Something, it must be admitted, takes place during such an outbreak. What it is I do not know, but the animals are in a very highly sensitive state, and the more vaccine you shoot into them the more are going to come down with the disease.

That was very forcibly impressed upon me in South Dakota in 1932, namely, that the heaviest losses occurred where the most vaccine was used. A man would become fearful after the first vaccination, and two or three days later perhaps one of his animals would die and he would think the vaccine was no good. He would go to the drug store and the druggist would confirm his suspicion that it was no good, and would sell him another product which, injected into the herd, might allay the man's fears. Then perhaps two or three days later, he would have another death or two, and he would get a third product from the drug store. In several instances, the more vaccine that was used, the higher the mortality.

We advocate that a man sit tight. If we can get him to ride it out the first four or five days, he will be a lot better off than if he continually repeats the vaccination. The best proposition, of course, is to vaccinate beforehand.

DR. KING: In considering vaccination for anthrax, it might be of interest to you gentlemen to hear of our experience in New South Wales.

Anthrax has been occurring in New South Wales for many years, and before vaccination was practiced, in the latter part of the last century, anthrax was responsible for tremendous losses in the middle western and southwestern parts of New South Wales. Losses were so heavy that some owners were actually forced out of the sheep industry. Anthrax occurs mainly in sheep, at the present moment in a well-defined belt of country extending from the northern border to

the southern border of New South Wales, roughly in our middle western country. It has also occurred in other districts.

When it was first known in Australia, it occurred commonly in the country immediately surrounding Sidney, County Cumberland. It was then known as Cumberland disease.

At the present time, no anthrax occurs in County Cumberland, and yet we have evidence that anthrax has persisted for a much longer period in soils in our middle western country.

Just before I left Sidney, I was able to see the plotting, on a map of New South Wales, of all anthrax outbreaks during the last ten years. They occurred in a small area, practically in the center of the state. We know that probably our worst anthrax country is the south central portion of the state, and at the present moment we are very interested in learning why anthrax is persisting more in the central district of New South Wales and apparently has not persisted to the same extent in the South.

We are instituting research work in an attempt to discover why that has occurred.

With regard to vaccination, in the anthrax districts vaccination is commonly used each year as a prophylactic. Owners have had experience with anthrax on their properties and will vaccinate all the sheep on the property. We get few breakdowns. I cannot remember any report of a breakdown following prophylactic vaccination when an outbreak of anthrax was not concerned.

Sheep coming from Queensland, where anthrax does not occur, into anthrax country in New South Wales, are also vaccinated. We do not appear to get any breakdowns there. We do get breakdowns, however, with vaccination during outbreaks. These are rare, but one occurred recently, and vaccine killed guinea pigs but did not kill sheep, and did protect sheep against subsequent injections of anthrax.

We cannot give any reason for such a breakdown, but in the majority of actual outbreaks, vaccination will control the outbreak satisfactorily. Deaths usually cease in about seven to ten days, and from then on the outbreak peters out. Vaccination is controlled rigidly. It is lawful only under permit from the Department of Agriculture. The property on which vaccination is performed is quarantined as a precaution for, I think, 60 days. That quarantine is supervised by a district veterinary officer, the senior field officer of the Department of Agriculture.

I thought that information might be of interest to you. (Applause)

PRESIDENT SMITH: Dr. King, we want to thank you. It is of value. We are glad to hear from our neighbors across the water.

DR. C. H. HAYS: I merely want to supplement statements made regarding pre-season vaccination. I was in contact with these previous outbreaks in South Dakota. In the same area where Indian cattle were vaccinated, there were a great many more other cattle vaccinated by owners during the same procedure, the spore vaccination, and we were in sufficiently close contact with our observations to have knowledge of the outcome. In no instance did we ever have anthrax occur on any other premises where the same procedure was followed as we had on the Indian-owned cattle premises.

It might be interesting, too, to know that in connection with that vaccination—of course, they were field cattle, semi-range in character—we never did see any local disturbance except in one or two instances. That is something that has a bearing on the situation.

In connection with what Dr. King mentioned, I want to make the observation that in the initial outbreak the disease is a disease of cattle, and we did not find the disease in sheep, even in the presence of sheep on the same premises where cattle were located. The same can be said, in a measure, regarding the horse population. The disease

that occurs first in cattle may spread to horses that are used in connection with the disposal of the carcasses of the dead animals.

Those are merely observations in connection with the other statement to which we have just listened.

PRESIDENT SMITH: Secretary Day has an announcement he would like to make.

SECRETARY DAY: Dr. Butler, knowing something about Dr. Dyson's condition, thought it would be a good thing for this Association to send Dr. Dyson a telegram. He drew this one up tentatively:

"In open session of the United States Live Stock Sanitary Association and Executive Sessions of the Executive Committee, by unanimous vote the members send you their heart-warm greetings and best wishes for happiness and most pleasant days to come, and they pray your health will be restored to you."

I suggest that someone make a motion that we send this telegram to Dr. Dyson.

DR. BUTLER: I move that the Association request you to send the telegram to Dr. Dyson.

. . . The motion was seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: Will the Executive Committee please remember that we shall hold a short session at 1:15 this afternoon?

The meeting will recess.

. . . The meeting recessed at 12:15 p. m. . . .

RECESS

FRIDAY AFTERNOON, DECEMBER 3, 1937

The sixth session convened at 1:45 p. m., President R. W. Smith presiding.

PRESIDENT SMITH: We shall change the order of the program just a bit, if there is no objection, and shall ask Dr. Cotton to read the report of the Committee on Legislation at this time.

. . . Dr. Cotton read the report. . . .

REPORT OF THE COMMITTEE ON LEGISLATION

DR. C. E. COTTON, *Chairman*, Saint Paul, Minn.

DR. J. S. BARBER, Providence, R. I. DR. WILLIAM MOORE, Raleigh, N. C.
DR. L. M. HURT, Los Angeles, Cal. DR. C. D. STUBBS, Little Rock, Ark.

Your Committee communicated with the live stock sanitary officials of the various states requesting information on legislation enacted since December, 1936, affecting the live stock industry, with particular reference to the control of communicable diseases. Replies were received from 37 states. The following is a summary of the information relative to new legislation received from the 37 states.

COMMUNITY SALES

The following states have enacted laws controlling live stock community sales: Colorado, Kansas, Michigan, Minnesota, New Mexico, Pennsylvania, South Dakota and Wyoming. Illinois adopted rules and regulations controlling such sales. Ohio amended its law enacted in 1935, to provide for the licensing and also a bond, the amount of which is represented by the nearest multiple of \$1,000.00 above the

average amount of sales during two business days, based on the total number of business days and the total amount of such sales, etc. The license fees provided in the above states vary from \$1.00 to \$100.00 and the bonds from \$1,000.00 to \$10,000.00. New York enacted a law providing for the licensing of dealers in cattle. California enacted a law licensing and placing the swine sales yards under supervision. Minnesota amended their rules and regulations providing for a \$2,000.00 bond by holders of permits operating live stock community sales.

BANG'S DISEASE

Officials of the following states report legislation relative to the control of Bang's disease:

Connecticut: Appropriated \$12,000.00 for payment for veterinary services in the testing for Bang's disease and for the maintenance of their laboratory service.

Delaware: Enacted legislation providing that indemnity for cattle under the Area Plan be limited to \$20.00 for grade animals and \$40.00 for purebred animals.

Florida: Appropriated \$25,000.00 annually for the years 1937 and 1938 for indemnity.

Georgia: Enacted legislation for the testing under the Area Plan.

Michigan: Law enacted providing for area testing; however, the law will not be operative for the reason that no appropriation was made to carry out the provisions of the Act.

Montana: Enacted corrective legislation for the payment of indemnity for animals affected with any communicable disease.

New York: Amended its law to provide for blood-tests for Bang's disease and for the payment of indemnity for cattle reacting to the test for Bang's disease on the same basis as for tuberculosis.

North Carolina: Enacted legislation for compulsory testing or the quarantining of cattle in coöperation with the federal Bureau of Animal Industry.

Oregon: Providing for compulsory testing of cattle when 60 per cent of the owners sign the agreement or if 70 per cent of the herds have been tested. The law provides for a limit of indemnity for a grade animal of \$20.00 and a purebred animal \$50.00, and further provides that 22c for each animal tested shall be paid by the counties to assist in the expense of the program.

Pennsylvania: Providing for the payment of indemnity to the limit of \$32.50 for a grade animal and \$50.00 for a purebred animal, and further providing that the limit shall not exceed 90 per cent of the appraised value of the animal.

Texas: Providing for the branding of animals that react to the Bang's test but no provision was made for the enforcement of the Act.

Wisconsin: Enacted two laws, one providing for the control of Bang's disease under the Area Plan and also specific appropriations for the payment of indemnity under the Area Plan.

OTHER LEGISLATION

Alabama: Legislation requiring all dogs "be inoculated for rabies."

California: Enacted legislation governing importation of swine. Amended its law by providing for the compulsory tuberculin test of beef cattle whenever the percentage of reactors among dairy cattle has been reduced to 1 per cent or below; and further providing that any tuberculosis control area shall consist of one or more counties.

Amended the law by providing that the maximum indemnity paid by the State for tuberculous cattle shall not exceed \$15.00 for any grade or \$25.00 for a purebred animal. Appropriated \$1,500,000 to continue tuberculosis eradication. Enacted legislation requiring "goat and sheep milk for cheese to meet the same code requirements as those applicable to cheese for cow's milk." Enacted legislation prohibiting the sale of unpasteurized milk from untested cows in the wholesale trade.

Connecticut: Enacted a law providing for the licensing of slaughter-houses and providing for the inspection of meat and meat products.

Florida: Enacted legislation providing an appropriation of \$50,000.00 annually for two years for the purchase, distribution and administration of anti-hog cholera serum and virus through proper agencies at 50 per cent of actual cost, to any owner of swine.

Georgia: Law providing that the office of the State Veterinarian shall be re-established.

Indiana: Enacted legislation to require the pasteurization of all milk sold or distributed except and when a corporation sells milk for household use from their own cows or herds, or from officially accredited tuberculosis-free herds and herds that have been officially tested for tuberculosis and Bang's disease; also legislation prohibiting the sale of diseased animals and providing for the control of rendering plants and the disposal of carcasses of dead animals, requiring a license fee of \$150.00.

New York: Amended law by providing full authority to tuberculin-test and retest all bovine animals.

RECOMMENDATIONS

(a) Your Committee recommends that the Association make the necessary provisions whereby it shall be the duty of its Secretary to receive and file copies of all the laws and the rules and regulations of the states relative to communicable diseases of live stock, including poultry; the Acts of Congress and the laws and regulations of the Bureau of Animal Industry, U. S. Department of Agriculture; the laws of the Dominion of Canada and the rules and regulations of the Health of Animals Branch of the Department of Agriculture of the Dominion of Canada; the laws of the United States government controlling the importation of live stock, including poultry; and to arrange to receive and compile the new legislation and rules and regulations from the various governments and states. This service will be of material value to the membership.

(b) Your Committee recommends that for the reason that the interstate traffic of certain biological products, particularly those containing living organisms or the active virus of infectious communicable diseases of live stock, including poultry, are a source of danger and an economic loss to the owners of live stock, and for the further reason that these products are sold and distributed under claims relative to their efficiency that cannot be supported by the best scientific knowledge, that this Association respectfully request the Secretary of Agriculture, the Federal Trade Commission and the Pure Food and Drug Administration of the United States Government to establish rules and regulations and if necessary adopt the necessary procedure to have legislation by Congress, whereby the licensing for the manufacture, for the shipment interstate for sale and distribution, of biological products containing live organisms or the active virus of infectious communicable diseases of all live stock including poultry, be subject to cancellation or revocation of such licenses, providing the

packages containing such products carry labels or if the publicity or advertising for the same includes statements or claims that are not in keeping with the present scientific knowledge relative to the value and merit of such products and their use.

(c) Your Committee further recommends that this Association request the Secretary of the United States Department of Agriculture and the live stock sanitary officials of all states to use every effort to obtain the passage of an Act of Congress requiring that all biological products licensed by the federal Bureau of Animal Industry, baby chicks and eggs intended for hatching purposes shipped interstate by the United States Postal service, railway express, railroads, airplanes, trucks, and all other public and private carriers be required to comply with the rules and regulations of the United States Department of Agriculture and the laws and the rules and regulations of the states to which such products are consigned. (Applause)

DR. COTTON (continuing): Gentlemen, I move that this report be accepted.

. . . . The motion was severally seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: The next paper on the program is "The Progress and Status of Coöperative Tuberculosis Eradication Work," by Dr. A. E. Wight, Chief of the Tuberculosis Eradication Division, Bureau of Animal Industry, Washington, D. C. (Applause)

. . . . Dr. Wight read his paper. . . .

PROGRESS AND STATUS OF COOPERATIVE TUBERCULOSIS ERADICATION WORK

By A. E. WIGHT, Washington, D. C.

*Chief, Tuberculosis Eradication Division, Bureau of Animal
Industry, U. S. Department of Agriculture*

Twenty years is a long period of time, but when we met in this hotel that number of years ago this month, and discussed the subject of tuberculosis eradication among live stock, there were not many who believed that the eradication of this disease among cattle could be anywhere near completed in that period. During this time, the coöperative tuberculosis eradication program has been in effect throughout the United States, starting from a small beginning in the first few years, but gradually increasing to a point where it was possible to conduct tuberculin tests of approximately 25,000,000 cattle in one year.

It is gratifying to note the great accomplishments in this field, and, while the disease has not been eradicated from all the cattle and swine in the United States, sufficient progress has been made to give us hope that this will be accomplished at some later date. In closing his first address on the subject of "The Eradication of Tuberculosis from Cattle and Swine," before this Association

in December, 1917, the late Dr. John A. Kiernan pointed out that what was needed to accomplish results was the coöperation of the people, and that their confidence must be obtained by well-directed efforts and efficient, consistent service.

I shall take this opportunity of again complimenting the many persons who have contributed so much to bring about the good results. I believe, in most instances, that they have obtained the confidence of the people, especially the cattle-owners, by their well-directed efforts and efficient, consistent services.

At the same meeting to which I have just referred, the original Uniform Methods and Rules were adopted and submitted to the respective live stock sanitary officials of the separate states and to the federal Bureau of Animal Industry. This uniform plan was adopted by all the states as well as the federal Bureau.

My report today on "The Progress and Status of Coöperative Tuberculosis Eradication Work" will be along the usual lines. There will also be available another report containing various statistical tables regarding the progress of this project.

During the fiscal year ended June 30, 1937, tuberculin tests were applied to approximately 13,750,000 cattle, and the percentage of reactors was 0.7, the same as during the previous year, which is the lowest degree of infection since the work began in 1917. This work was conducted in many different sections of the country by the federal, state, county and accredited veterinarians. The great volume of work accomplished during the past year has made it possible to place many additional counties in the modified tuberculosis-free accredited area. Additional federal funds were available, which made it possible to conduct an extra large volume of work.

STATE AND FEDERAL FUNDS

State funds for this work during the past year amounted to approximately \$4,500,000, which is about the same amount as was used during the previous year. The regular federal appropriation for the fiscal year 1937 was \$1,500,000, of which \$396,884 was for indemnity and the remainder for necessary operating expenses. In addition to the regular appropriation made by the federal government, approximately \$2,700,000 of emergency funds were also used for indemnity and operating expenses.

ACCREDITED-HERD WORK

The records of the Bureau of Animal Industry indicate that on October 1, 1937, there were approximately 272,000 fully accredited herds, containing about 3,789,000 cattle. This is about

the same number as has been reported during the past three years. In some states the accredited-herd feature of the program continues to be of much importance, especially in herds of purebred registered cattle, while in others not very much attention is given this feature of the work. The retesting of accredited herds in some states has been conducted by local practicing accredited veterinarians at state expense, which plan is proving to be very satisfactory.

AREA WORK

The tuberculin-testing of cattle under the area plan has constituted the greater part of the work during the last fiscal year, and from November 1, 1936, to October 30, 1937, 93 counties were added to the list of those in the modified accredited area, indicating that bovine tuberculosis in such areas existed to less than 0.5 per cent. Thirty-seven municipalities in Puerto Rico were also placed in that status.

On December 1, 1936, Pennsylvania was added to the list of states in which all the counties were in the modified accredited area. Maryland was so classified on July 1, 1937, New Jersey on September 1, and New York on October 1, making an increase of four states since November, 1936.

For a number of years it has been customary in some states when all the counties have been placed in the modified accredited area, to hold what is known as "Achievement Day" celebrations, and on such occasions programs are provided to give publicity to the importance of the fact that bovine tuberculosis has been reduced to less than 0.5 per cent, and to call attention to the necessity of conducting adequate follow-up work in dealing with this disease among live stock. During the past year, such meetings were held in Pennsylvania, New Jersey and New York, with gratifying results.

The United States Department of Agriculture has this year furnished Modified-Accredited Area Certificates, signed by the Secretary of Agriculture and the Chief of the Bureau of Animal Industry, to each of the states in which all the counties have been placed in that classification as a formal recognition of this accomplishment. These certificates have been well received.

There are now only two states, namely, California and South Dakota, in which all the counties are not in the modified accredited area. In those states the work is being conducted on an extensive scale, and good progress is being made. Prospects of completing the work in South Dakota within the next six

months are good, and it is believed that most of the counties in California will be placed in the modified accredited area within the next twelve months. Very good progress has been made in area tuberculosis eradication work in Puerto Rico in coöperation with the Department of Agriculture and Commerce of that island.

CATTLE TUBERCULIN-TESTED FOR INTERSTATE SHIPMENT

Most of the work conducted in connection with the tuberculin-testing of dairy and breeding cattle for interstate shipment has been done by approved veterinarians who, during the past fiscal year applied such tests to approximately 187,364 cattle, of which 160 were found to be reactors. These tests were made in compliance with local state requirements, as the federal regulations do not require the tuberculin-testing of cattle originating in modified accredited areas unless coming from herds under local quarantine for tuberculosis.

AVIAN TUBERCULOSIS

The control and eradication of avian tuberculosis, which is readily transmissible to swine, have been parts of the regular program in connection with tuberculosis-eradication work. Several years ago, the policy of observing poultry flocks at the time the cattle on the premises were being tested for tuberculosis was taken up. This has been continued, and during the past fiscal year approximately 128,000 flocks, located in twelve states, were observed by veterinarians in the field. Infection was reported on about 3,000 farms.

Working under another project separate from the one just mentioned, about 16 Bureau veterinarians were engaged in the eradication of avian tuberculosis in the central and north central states where the disease is very prevalent. These veterinarians not only observed and made physical inspections of flocks, but tuberculin-tested a large number of birds in order to determine whether or not, and to what extent, the flocks were infected. In connection with these observations and autopsies, these employés inspected approximately 1,200,000 birds, located on about 10,000 premises, since December 1, 1936. Reports indicate that as a result of these inspections about 200,000 fowls, located on approximately 1,200 farms, were found to be infected. These employés, and one veterinarian employed by the Illinois State Department of Agriculture, since December 1, 1936, tuberculin-tested approximately 150,000 fowls, including hens, pullets and roosters. About 8,500 reactors (5.7 per cent) were disclosed. The low degree of infection found in connection with this work

is accounted for by the fact that a considerable amount of it was the application of retests to flocks previously tested and where the eggs were being used in commercial hatcheries.

These veterinarians also applied tuberculin tests to swine on many farms during the year, using both avian and mammalian tuberculins at the same time. The highest percentage of reactors among the swine tuberculin-tested was found as a result of the application of avian tuberculin.

It has been possible to conduct a considerable amount of tuberculin-testing of poultry and swine in some of the states on an area basis, that is, where all the poultry and swine in a unit, such as a township, were tested. Tuberculosis of the avian type has been found to be very prevalent in many localities in the central and north central states. Some infection has also been found outside of that area. The avian type has caused generalized tuberculosis in swine, which necessitates the carcass being condemned as unfit for food. Just recently, a report was received by the Bureau indicating that this type of tuberculosis has been found in the calves of a purebred herd of cattle that was accredited, but, as yet, the source has not been determined.

All this indicates that the avian tuberculosis problem is one that must receive more attention. The owners of poultry in the infected areas are being continually informed regarding the importance of eliminating the disease, but it seems to be very difficult to control it because of the methods followed in handling the poultry on many of the infected farms.

No payments, either federal or state, comparable with indemnities for cattle, have been made for tuberculous hogs or poultry, nor have the owners received official financial aid in other respects for hogs or poultry in connection with the eradication of this disease. Some thought has been given this subject, believing that it might be possible to bring about more satisfactory results if some form of compensation could be made when it was necessary for owners to dispose of their flocks and go to considerable expense in cleaning and disinfecting the premises and establishing more satisfactory methods of handling the flocks. Work done in coöperation with the owners of large commercial hatcheries has proved very satisfactory in some states.

DECREASE IN THE AMOUNT OF TUBERCULOSIS FOUND AMONG CATTLE AND SWINE

According to the records of the Meat Inspection Division of the United States Bureau of Animal Industry, there continues to be a reduction in the number of cattle showing lesions of tu-

berculosis on postmortem examination. During the last fiscal year approximately 11,000,000 cattle, exclusive of known reactors, were slaughtered under federal supervision, of which only 15,816 (0.15 per cent) showed any evidence of tuberculosis. Of the total number of cattle showing any infection, 4,003 were either condemned as unfit for food or passed for cooking purposes. This is about 0.04 per cent of all the cattle slaughtered under federal supervision during the past fiscal year.

There was also some decrease in the percentage of hogs showing any evidence of tuberculosis on postmortem examination during the past fiscal year. The records of the Meat Inspection Division show that of the approximately 36,200,000 hogs killed under federal supervision, 9.3 per cent showed some evidence of tuberculosis. Of the more than 36,000,000 hogs killed under federal supervision, about 15,000 (0.04 per cent) were condemned, and 18,000 (0.05 per cent) were passed for cooking purposes under federal supervision. More detailed information in this connection will be found in the tables contained in the statistical pamphlet available for you at this meeting.

Reports received from the Meat Inspection Division in cases where hogs or cattle show evidence of tuberculosis on postmortem examination are very helpful in locating centers of infection in the field by tracing the origin of the live stock. This feature is being developed to a point where it is much more valuable than in previous years.

JOHNE'S DISEASE (PARATUBERCULOSIS)

This project was conducted to a limited extent during the past fiscal year. About 2,100 cattle, located on 53 farms in 13 states, were tested, disclosing 136 reactors (6.5 per cent).

PERSONNEL

The state and territorial authorities employed an average of about 265 veterinarians on full time during the past fiscal year, while the counties employed about 253 veterinarians. The federal government employed about 400 emergency veterinarians during the year, including those working on a part-time basis at a per diem rate. In some localities local helpers were employed to assist the field veterinarians. The regularly employed veterinarians of the Bureau have continued to supervise this work in many sections of the country.

APPRAISAL, SALVAGE AND INDEMNITY

The average appraisal of cattle reacting to the tuberculin test during the past fiscal year was \$86.04. The average salvage was

\$28.94, which is about \$2.00 per head higher than during the previous year. The combined state and federal payments received by owners amounted to an average of approximately \$55. Five per cent of the cattle condemned were registered purebred animals. The maximum federal payment continues to be \$25 for grade cattle and \$50 for registered purebred cattle.

CONCLUSION

In closing, let me point out that it is apparent, from the status of the work after a period of 20 years of effort, that it is possible to control and eradicate bovine tuberculosis, but the necessity of continuing the work, especially in sections where there was a considerable amount of the disease in the beginning, is one of much importance. Adequate follow-up measures are very essential, and if even only a few reactors are found in the testing for remodification of the counties, their prompt removal is necessary.

I wish to take this opportunity to express my appreciation of the splendid coöperation that has been rendered by the various state live stock sanitary authorities with whom we have been coöperating in the project during the past year. The live stock owners, the public press, the radio, live stock commissioners, and many others have done much to assist in the great work that has been conducted in tuberculosis eradication during the past twelve months. (Applause)

PRESIDENT SMITH: Dr. Wight, we thank you for this splendid report. If there is no objection, we will have all of the papers read before we have discussion on them, as time is short.

The next speaker needs no introduction to this audience. He is Dr. E. T. Faulder, Director, Bureau of Animal Industry, Albany, N. Y., who will present a paper entitled, "The Eradication of Tuberculosis in the Herds of New York State and the Accreditation of the State." (Applause)

. . . Dr. Faulder read his paper. . . .

THE ERADICATION OF TUBERCULOSIS IN THE HERDS OF NEW YORK STATE AND THE ACCREDITATION OF THE STATE

By E. T. FAULDER, Albany, N. Y.
Director, Bureau of Animal Industry

This project had its inception during May, 1918. From that time to the present, it has been the goal of all concerned to have New York State recorded as one of the accredited states of the

Union. The problem was a large and costly one and required the tuberculin-testing and retesting of 153,000 herds, representing 2,000,000 cattle, at a cost, for indemnity alone, of \$57,000,000, of which \$46,000,000 was paid by New York State and \$11,000,000 by the federal government.

The percentage of tuberculosis was high and the disease was deep-seated in a large number of our extensive dairy counties. From the beginning, the area plan of testing was adhered to, with emphasis on the importance of thorough cleaning and disinfection.

The thorough cleaning and disinfection of infected premises is recognized as one of the principal factors in the building up and maintaining of disease-free herds. In New York State the work of disinfection is carried on by authorized disinfectors, the work being done at the expense of the cattle-owners. The owner is given written instruction as to how to clean his premises and the authorized disinfectors, numbering approximately 80 and located at strategic points in the 62 counties, work under authorizations from the Department of Agriculture and Markets and each authorized disinfecter is required to be equipped with a power disinfecting outfit to which a heater is attached. This places the authorized disinfecter in a position to do any cleaning which may have been overlooked by the owner, and this cleaning is done by the use of boiling water applied under pressure and to which lye or soda has been added. The disinfecter is then in a position to apply one of the permitted disinfectants with water heated to the proper temperature and applied under pressure.

In bringing the state to the point of accreditation, 965,000 tuberculous animals have been removed from the herds and slaughtered, and the extent of this disease has been reduced from approximately 40 per cent in 1919 to less than 0.5 per cent at the present time. New York now has 145,000 accredited herds and 8,000 herds which have passed either one or two successful tests, only a small percentage of which showed infection on the last test.

If the 965,000 tuberculous animals which were condemned, removed from the herds and slaughtered, were placed head to tail, the line would reach from New York City to a point 136 miles west of Chicago, or a total distance of 1,096 miles. These same animals, if placed in cattle cars, allowing 25 animals to a car, would make up 38,600 carloads, or 386 trains of 100 cars each.

The number of individuals actually engaged in the campaign, dating from 1918 to the present time, increased rapidly and during the intensive years of the campaign the number employed

were 30 full-time state veterinarians; 15 full-time federal veterinarians; 50 county veterinarians; 400 accredited veterinarians; approximately 100 federal per diem veterinarians; 90 authorized disinfectors, and 30 appraisers. A bovine tuberculosis committee existed in all of the counties, the members numbering 366. These energetic individuals interested in tuberculosis eradication served without pay and their services were invaluable. Throughout the campaign financial assistance was forthcoming from the county boards of supervisors of more than 50 counties and the total amount appropriated by the various boards during the period of the campaign totaled close to \$3,000,000. We also had the full coöperation and support of all the county agents, local health officers and other civic organizations.

The goal has now been reached, and on October 1, 1937, New York State was recorded as accredited. This great accomplishment has been due to sound organization, a workable plan and program, combined with real team work on the part of a legion of workers, plus coöperation of federal officials, county boards of supervisors, bovine tuberculosis committees, health agencies, veterinarians, appraisers, office workers and, last but not least, the great army of cattle-owners.

On November 4, 1937, New York celebrated the accreditation of the state, the day being known as "Achievement Day." The celebration consisted of morning and afternoon sessions, participated in by many prominent speakers, and a luncheon at noon presided over by our Commissioner, the guests being officials from nine states and Canada and a group of individuals who had played an important part in the eradication of tuberculosis from New York. This was followed by a banquet in the evening, entertainment and dance participated in by 576 individuals.

The fact that New York State is now listed as the 46th accredited state in the Union does not mean that the tuberculin testing has been completed or that tuberculosis eradication can be classed as a project completely finished.

We shall continue to retest the accredited herds in one county where the initial infection was very low once in three years, this county being located in the Adirondack Preserve, and in four additional counties where the initial infection was very low once in two years, possibly adding four more counties to this group in the near future. We shall also continue to retest all accredited herds in the remaining counties annually, and complete a thorough survey in all of the 932 townships for the purpose of locating assembled herds of cattle and subjecting such cattle to periodic retests; concentrate our attention on the herds

which revealed infection on the last test; apply retests to the herds which have passed one and two successful tests, and continue this practice until every bovine animal in the state, 2,000,000 in number, can be classed as having passed the required number of successful tests and eligible to be listed as "accredited."

Our work in connection with tuberculosis eradication will not interrupt the program to control and eradicate Bang's disease and our Bang's disease project, now well under way, will not be permitted to interrupt our tuberculosis campaign.

PRESIDENT SMITH: Dr. Faulder, we thank you for that report. The Chair must state that the doctor has been very modest in that part of his report pertaining to Achievement Day. I had the pleasure of attending that Achievement Day, and I want to tell you gentlemen that I never expect to attend another one as fine.

Dr. Faulder and Dr. Leonard, here at my right, did themselves proud. Of course, the Commissioner of Farms and Markets helped them.

There are a few things, however, that Dr. Faulder did not mention. It seemed impossible, when we got there in the morning, that they could carry them out. But the program ran right on schedule. Some of the finest papers I have ever heard were delivered all day long, and the audience stayed to a man.

The time is short, and we must hurry along. Many times this week I have heard the remark, perhaps not intended for my ears, that "Those Canadians are great fellows." Everyone who comes here is a great fellow. You are going to listen to one now.

Dr. E. W. Bond, of the Pathological Division, Health of Animals Branch, Department of Agriculture, Ottawa, Ontario, will now present his paper, "Some Observations on Morphological Forms Found in the Growth of Tubercle Bacilli and the Relationship of Such Studies to Future Research Work." (Applause)

SOME OBSERVATIONS ON MORPHOLOGICAL FORMS FOUND IN THE GROWTH OF TUBERCLE BACILLI AND THE RELATIONSHIP OF SUCH STUDIES TO FUTURE RESEARCH WORK*

By E. W. BOND, Ottawa, Canada

Health of Animals Branch

Department of Agriculture

INTRODUCTION

While working with several strains of *Bacterium tuberculosis* a few years ago, on the problem of dissociation, the writer became particularly interested in the morphological variation of

*Part of thesis on work done in Department of Pathology, University of Toronto, for the degree of Doctor of Veterinary Science. Published with the approval of the Veterinary Director General.

the organism. Stained smears from different strains, smears made from the same strain but at different ages of the culture, and smears made from different parts of a fair-sized single colony, presented a rather complex picture of the morphological range of *B. tuberculosis*. That morphological changes of the organism are simply the process of Nature is, of course, beyond all doubt. We also know that variations in temperature, light, moisture, and food requirements, must play just as important a part with bacteria as with the higher forms of vegetable life.

It is well known that cultures of avian tuberculosis produce more elongated thread and branching forms than do the human and bovine types. Young cultures of *B. tuberculosis*, particularly those freshly isolated from the diseased host, seldom show extensive pleomorphism. The wider range of morphology is found in cultures which have grown luxuriantly for two, three, or more, months. Available literature on this subject did not give any instances in which the progressive morphological changes of the organisms, step by step from the earliest visible growth to old age, had been followed in any strain of *B. tuberculosis*. Time will not permit, in this paper, a full citation of the literature covered, as it was quite extensive. One must, however, pay tribute to the tremendous compilation of F. Löhnis in his "Life Cycles of Bacteria" and Review of the Literature 1838 to 1918.¹ I would like to quote Philip Hadley²:

"* * * it consists in initiating a new branch of bacteriological study in which we shall strive to recognize bacterial species—relationships, not by a comparison of isolated single cultures of this or that, but by a study of all the various types or stages comprising the cyclogeny of the species in question—a difficult but necessary task. I believe it is only in this way that we shall come to understand the limits and the relative significance of cyclogenic fortuitous and impressed variations, and so be able to recognize the bacterial species in its entirety."

This statement by Philip Hadley was made in 1927, but as yet we have no complete life history or morphologic cycle of the organisms of any strain of *B. tuberculosis*. With this end in view, the writer chose a very pleomorphic strain of obscure origin in that it was obtained by dissociation from a laboratory culture. This culture proved very pathogenic for chickens and rabbits, but less fatal to guinea pigs. Small lesions were found in the mediastinal glands of a calf on slaughter 300 days after intravenous inoculation. By studying such a pleomorphic strain, it was felt one might obtain a wider foundation for future comparisons with other strains of *B. tuberculosis*.

SETUP OF CULTURES FOR STUDY

Since the culture had grown luxuriantly on Petroff's gentian violet-egg medium, 30 tubes of this culture medium were chosen and divided into three sets of ten in each. One set was nine months old, another six months, and the other three months. The latter contained a small amount of sodium silicate, the six-month-old medium had never produced luxuriant growth of any strain of *B. tuberculosis*, the nine-month-old and three-month-old sets had produced luxuriant growths and were employed to find what effect, if any, storage in the refrigerator might have on such culture media. As a further experiment, six drops of 10 per cent saline solution were added at the time of sowing to three tubes in each of the three sets, to find the effect of added salt upon the resultant cultural growth. This idea was from the article by Dunlop and Maitland, of Glasgow,³ who found that the addition of sodium chloride to the agar medium produced pleomorphic changes in *Proteus vulgaris*. The inoculum for the 30 tubes was prepared from a 97-day-old culture of the pleomorphic strain which had been re-isolated from the calf previously mentioned, by making a suspension of the organisms in sterile distilled water, filtering through one thickness of filter paper to remove clumps, the resultant filtrate being next transferred to the tubes with a capillary pipette.

The resultant growth showed no noticeable difference in any of the three sets from the presence of extra salt, and the nine-month-old and three-month-old media gave equally luxuriant growth. The six-month-old media, however, produced a very meagre, thin, film-like growth and presented a different general morphological picture of the organisms. Smears were made from the plain and the saline tubes of each set, starting at 18 days, over a period of 228 days, at about seven-day intervals, studied briefly and carefully indexed and filed for future study.

This large number of stained smears provided a good basis on which to study the morphological changes. As each smear was studied, colored drawings were made showing the general picture and the morphological forms, and thus, as the number of drawings increased, the general trend of the bacillary cycle was made more clear than would be possible by microscopic study alone, for this pleomorphic strain presented a complex picture in the original inoculum and throughout the series.

The four smears—from the luxuriant growth on the nine-month-old and three-month-old media—always showed the same general changes. The two smears from the meager growth on

the six-month-old medium showed the range of pleomorphism greatly reduced. This phase will be described separately.

In following the progressive stages of the organisms during their cultural growth, in this study two active processes, namely, multiplication and death, were observed. Death of the organisms may be observed in a stained smear of *B. tuberculosis* made from a very young culture growth, particularly if the seeding of the culture has been made from a well-matured culture. In the studies made upon the pleomorphic strain under consideration, the earliest evidence of death of organisms was their loss of acid-fastness. This was seen to occur in all the series of smears. When taken from very young cultures, the smears show comparatively few non-acid-fast scattered here and there, and the morphology of many of them is suggestive that they are members of the seeding transfer which were not viable or that they had suffered some injury during the transfer, particularly so in that the dark-stained beaded forms which are known to have high resistance are not generally involved. Death followed by disintegration is not uniform. Death and loss of acid-fastness is mostly shown by the taking up of the blue counterstain. Disintegration becomes apparent by the organisms, either in whole or part, losing their clear definition of outline and disintegrating directly into a fine, cloudy blue, amorphous material. Quite frequently, a mass of organisms is involved and their breaking up produces a blue gelatinous mass, somewhat transparent, in which can be seen the darkly stained, beaded forms more or less unharmed by the change which has overcome their companions, which were in the vegetative phase. Blue, however, is not the only color involved in death and disintegration, for one less frequently observes slate gray and green colors in this process. Apparent death and disintegration were also observed without loss of acid-fastness, mostly in the breaking up of large pleomorphs which showed a loss of outline in a haze of rose-colored, cloudy material.

To illustrate the morphological range of the organisms taken from the luxuriant growths, lantern-slides of microphotographs have been prepared, but since a single microscopic field very seldom covers all points of interest, and the more minute and faintly stained forms are difficult to photograph in clear outline from an average smear which contains large, dark-stained forms, a small set of drawings was prepared. The first drawing is from the smear taken at 18 days. The dark-stained, beaded forms shown were also present in the original inoculum. A few of these are evenly dark stained and show no evidence of growth.

Others, particularly the ones with longitudinal segmentation of their beads, show growth of a more faintly stained or rose color between their segments. The other finer forms of the organism are present as rods and threads. Some of the thread forms in this young smear are seen to originate from the sprouting of small, dark-stained beads, others by the elongation of bacilli. There are different proportions in the thread form, the larger ones showing segmentation into both beads and short rods, while the very fine threads divide as minute rods. The second drawing, made from the smears only five days later, shows considerable change. Very few of the dark-staining, beaded types could be found and the cultures may be said to be almost completely in the vegetative stage. The thread forms are smaller, in fact, the smallest are near the verge of visibility in a magnification of 1,000 diameters. Small tufts of very small bacilli are present. Elongated bacilli or small threads can be seen dividing into two or more short rods. Here and there one finds three tiny beads connected by a very fine thread; most of the single beads are sprouting apparently to form new threads (fig. 1).

The third smear, taken at 32 days, in its general picture, shows enlargement of the thread forms with division into short rods and beads. In some instances the beads are showing longitudinal segmentation. The substance between these pairs of beads apparently has not taken up the stain. Careful study of the smears reveals a few very fine thread forms which are also dividing into minute rods and beads. The latter are exceedingly small. Tufts of very small bacilli are present, as described for the 23-day smears. The bacilli, however, are somewhat larger and most of them are involved in the formation of tiny beads or division into two or more very short rods (fig. 2).

In this maze of active vegetation of the organisms, the identity of the forms noted in the original inoculum and the first smear is, unfortunately, lost.

Smears made at 41 days and 48 days show the same activity in progress with enlargement and increased retention of stain by the beaded forms, *i. e.*, a return to the forms found in the original inoculum and first smears.

The smears taken at 57 days show this return to the original more completely. The thread forms continue their activity of elongating and dividing into rods and single and double beads (fig. 3). It would be impossible to determine the number of times this process of elongation and division has taken place. The return to dark staining acid-fast of the larger beaded and segmented forms is difficult to account for accurately. That it is

a definite step in the cycle is of course evident. We know also that the problem of food supply and accumulation of products from the growth and disintegration of the organisms may play a part.

These dark-stained, beaded forms are of several types. Some have more or less round beads, others single or as a short chain; some have considerable variation in the length of their beads or segments, particularly noticeable when they enter into active elongation by the appearance of faint, rose-stained protoplasm between their segments. At 93 days (fig. 4) the fine vegetative activity is still present, as in the previous smears, and it may be mentioned that such persisted throughout the 228-day study of this culture. Pleomorphism is now rampant and is produced by the varied development of the dark-stained forms. Long giant thread forms have developed from those which showed longitudinal fission. As these forms elongate by growth of the rose-stained protoplasm between their segments, the dark-stained parts diminish in size until they are finally represented by faint dark marks. The shape and size of these large thread forms are influenced by the character of the dark-stained parts or segments. In some instances a segment is seen to develop a lateral bud or sprout and thus give rise to a branching form. Most of the branching forms appear to originate from a single, irregularly shaped, dark-stained bead or segment, which has become detached from its companions. As these enlarge they become somewhat triangular in shape and later send out three sprouts. Other large beads develop a single sprout, giving rise to a large drumstick shape. Others enlarge to form more or less spherical or apple-seed shapes. This drawing also shows instances of the fate of the large threads, by a process of granulation of their protoplasm ending in minute specks. Subsequent smears did not definitely reveal the future of these minute granules but tufts of very fine threads, more slender than those of other tufts, were suggestive of having originated from them.

Continued study of this series of culture smears up to the 228 days (figs. 5 to 10) shows the same activity of multiplication of the organisms in the young vegetative bacilli, granules and fine threads, and the same process of development of the dark-stained forms into large thread and branching forms, which finally break up as previously described into minute, faintly stained, acid-fast granules. The large sphere and apple-seed shapes, including those of drumstick type, add to the pleomorphic picture by their development into giant thread and branching forms. These may be plainly seen in the microphotographs (figs.

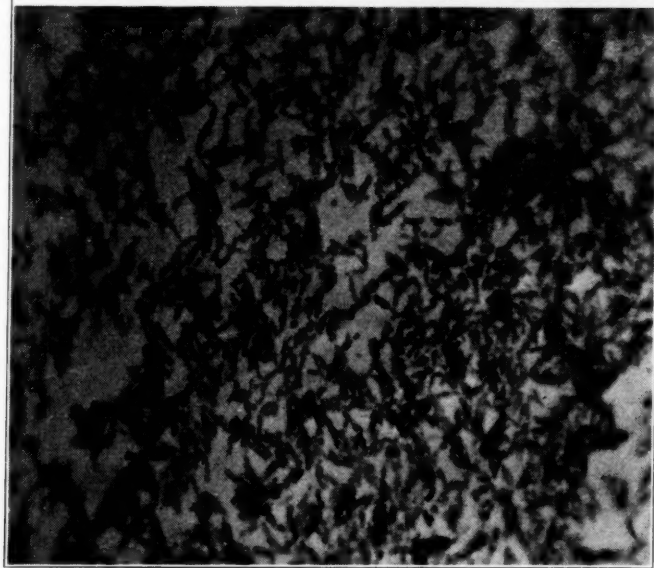
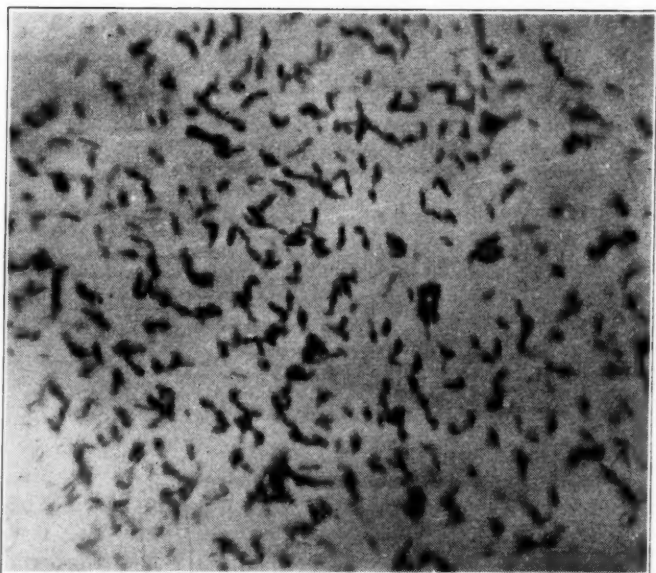


FIG. 1 (above). Smear preparation of culture of *Bacterium tuberculosis* (23 days).

FIG. 2 (below). Smear preparation of culture of *Bacterium tuberculosis* (32 days).

7 and 8). These differ from the thread and branching forms previously described in that they are, in general, more acid-fast and that their threads and branches segmenting into uneven sizes are seen to stain a very dark red. These dark segments again develop into new large long thread and branching forms of about the same size as those previously described and thus make a very difficult problem for interpretation. Of special interest was the occasional occurrence of certain small thread and branching forms, faint red or rose-stained, which developed small, light blue beads, later segmenting into small rod bacilli, each containing a blue bead. They were too few in number to follow accurately in the smears from the luxuriantly growing cultures, but will receive further mention in a description of the smears from the meager growth.

One further item of interest is the occurrence of daughter colonies. In these studies they were found to appear as small glistening bead-like elevations on the surface of the massive growth. Smears from these fresh eruptions showed them to be composed of a mass of more or less gelatinous blue material, in which the outline of almost every morphological form now non-acid-fast could be distinguished in the process of disintegration. Each of these secondaries or eruptions contained a quota of acid-fast in the dark-stained resistant stage. Further study of the secondary colonies showed the acid-fast entering the vegetative stage to form new bacilli and short threads and the blue gelatinous material gradually dispersing, the last remnants appearing as a hazy blue film.

DESCRIPTION OF THE MEAGER GROWTH CULTURES

The general picture differed from that of the smears from the luxuriant growth in that the short rod bacilli predominated throughout. The same picture of death and disintegration of single organisms and of large groups, into a gelatinous blue mass or as cloudy blue material, was evidenced. There was no production of secondary or daughter colonies. The large, dark-stained, beaded forms were very few in number and many fields of the microscope had to be searched to find them. Representatives of all the large, dark-stained forms were found. The rod bacilli multiplied by transverse fission, by sprouting of their beads and by the cocci-to-diplococci method. Of particular interest was the development of tufts of long threads of fine to medium size in areas which had been involved in blue gelatinous disintegration, suggesting that their development depended upon the disintegration products as suitable food material. These long

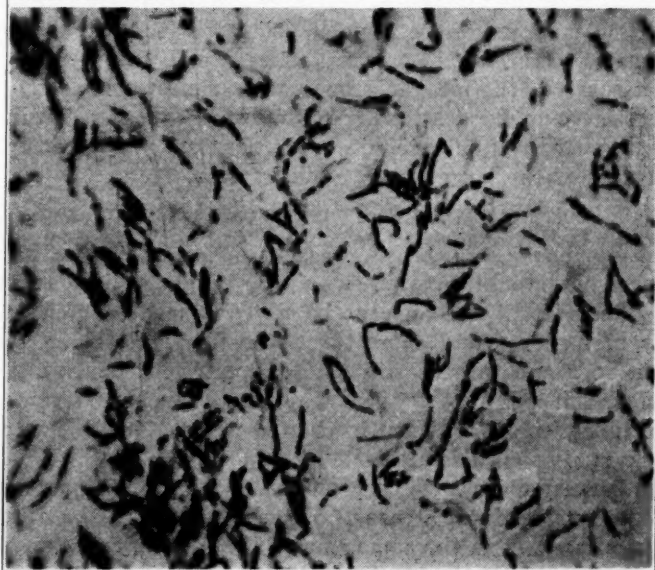
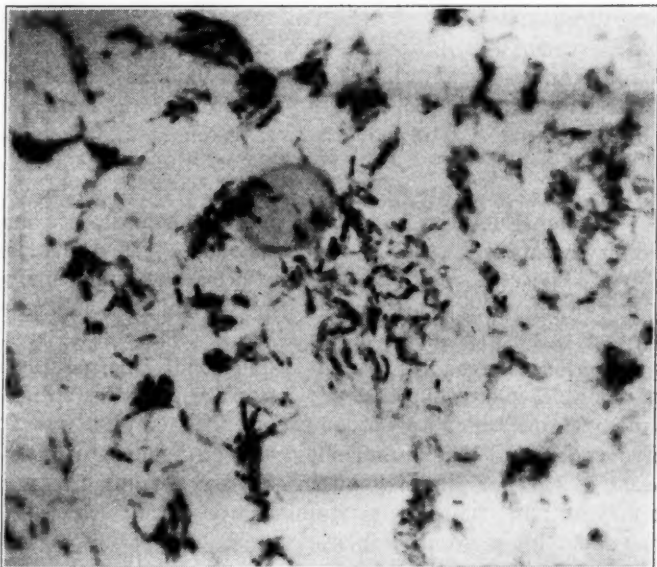


FIG. 3 (above). Smear preparation of culture of *Bacterium tuberculosis* (57 days).

FIG. 4 (below). Smear preparation of culture of *Bacterium tuberculosis* (93 days).

slender threads, together with their few branch-forming companions, presented a light blue beading, and segmentation into short rods containing one blue bead. The various stages of this development were followed, showing them to become typical acid-fast bacillary rods. The last smears, taken at 228 days, were composed almost entirely of short, acid-fast rod bacilli, cocci and diplococci.

The foregoing description covers the morphological forms observed in the stained smears prepared over a growth period of 228 days. The cultures, however, at the end of this time, were still active and perhaps capable of further changes in the morphology of the organisms. Cultures of *B. tuberculosis* are able to live for long periods under favorable conditions, particularly where a single colony has the whole surface of a Petri dish culture medium on which to spread. One such culture was found to have vegetative bacilli and short thread forms, brightly red acid-fast in the peripheral growth. Two years and five months after sowing, this plate, in particular, was firmly sealed with a heavy rubber band closely adherent to the glass, thus preventing dehydration of the medium in the incubator. Although the same morphological forms were found in both the luxuriant growths, the general picture of the smears differed vastly between the two in that those of the meager growth were almost completely void of vegetative multiplication by means of the fine long threads which segment into minute rods and granules, and the comparative rarity of the large, dark, beaded forms.

MORPHOLOGY OF *B. TUBERCULOSIS* IN LESIONS

That morphological variation occurs in lesions is well known. One may observe this plainly in a case of generalized tuberculosis. Some small and apparently newly formed tubercles yield evenly stained rod and short thread bacilli, while older lesions present rods and threads with one or more very darkly stained beads. Winn and Petroff⁴ report finding branching forms only in the tubercles of a chicken inoculated with a smooth S variant in their studies on dissociation.

Two lantern-slides have been prepared, one from a photograph of a smear made from a case of Hodgkin's disease, the other of drawings made from the same smear. The lesion concerned was a pus pocket in the lung. The photograph shows the massive growth of large organisms with their dark-stained portions. The drawing was made to show individual forms and to record the occasional, more or less giant pleomorphs located by a careful search of the whole smear. No definite branching forms were

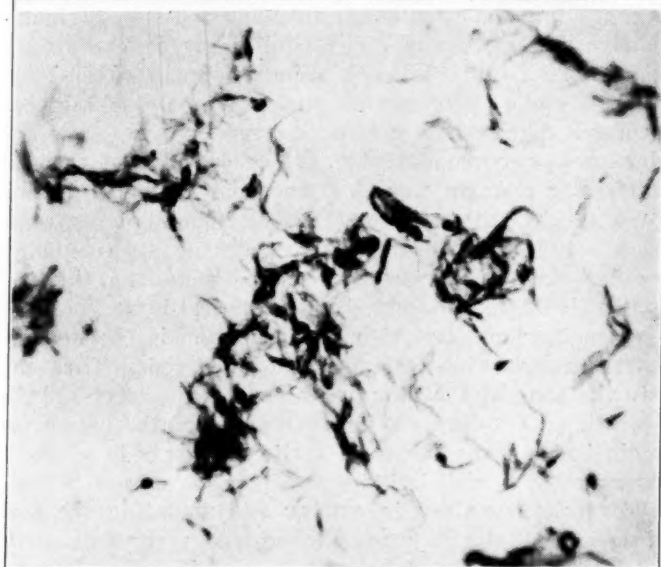
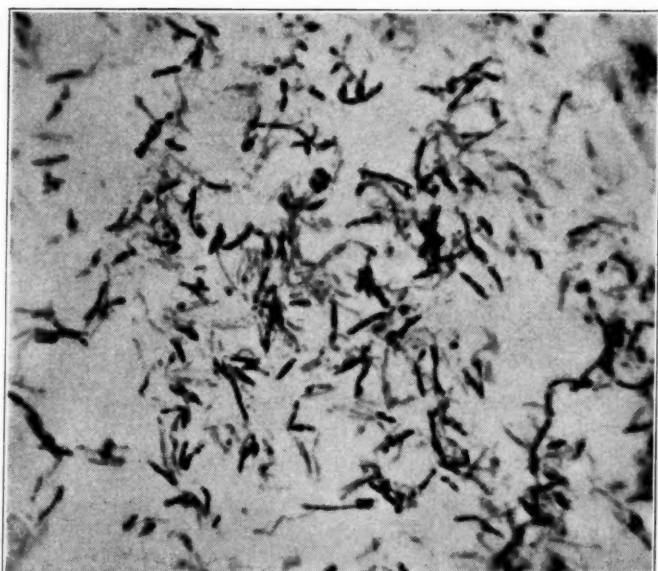


FIG. 5 (above). Smear preparation of culture of *Bacterium tuberculosis* (119 days).

FIG. 6 (below). Smear preparation of culture of *Bacterium tuberculosis* (151 days).

seen. The pleomorphs in this lesion smear differ somewhat in type from those of the culture previously described. The fine vegetative phases of granules, rods and threads were plainly seen, as also the enlargement of the pleomorphs by lighter stained growth between their dark beads and segments. The three twin forms shown on the top left of the drawing stained a dark blue. The large forms shown in the drawings from the axillary, mediastinal and cervical glands were also non-acid-fast. Since this case was not followed by a study of cultures, one can only draw attention to the fact that the small glandular lesions contained acid-fast of the small bead and rod type only, in comparison with the wide range of forms found in the pus pocket of the lung. It is quite evident that rapid free growth was taking place in the lung lesion, while in the lymph-glands such was in abeyance or inhibited.

VERTICAL SECTIONS OF COLONIES

A brief study of vertical sections of colonies was made, using the technic of Kahn,⁵ in which the colonies with their supporting egg medium are fixed in formalin and embedded in warm agar. Blocks containing the colonies are then cut in 4-micron thickness on the freezing microtome. The studies given here are from tubercle bacilli freshly isolated from a human case (bladder urine) on Dorset's plain egg medium, and on Dorset's glycerin-egg medium. The latter produced larger colonies.

Under low-power magnification, the colony sections from Dorset's plain egg medium were low and compact, with a general picture of acid-fastness. Under the oil-immersion lens (magnification $\times 1,000$), the organisms next to the egg medium and at the outer edge or periphery were found to be long, thread-like and non-beaded. Immediately above the lowest layer, the threads were segmenting into two shorter forms, and in the next layer the short threads divide again into two short rods. Then, merging into the body of the colony, are short rods, cocci and diplococci, which take a deeper stain than those of the lowest layer. The main body of the colony in section presents in appearance the structure of a wall built of rough cobble-stones. The fine artificial cracks sustained in cutting and mounting the section afford an opportunity to study the protruding or separated organisms throughout the structure. The main body and surface of the colony is composed of short rods, beaded and non-beaded, single beads or cocci and diplococci, and distributed throughout the colony are non-acid-fast of the same form and size as their acid-fast companions, but, unlike the acid-fast, they are in-

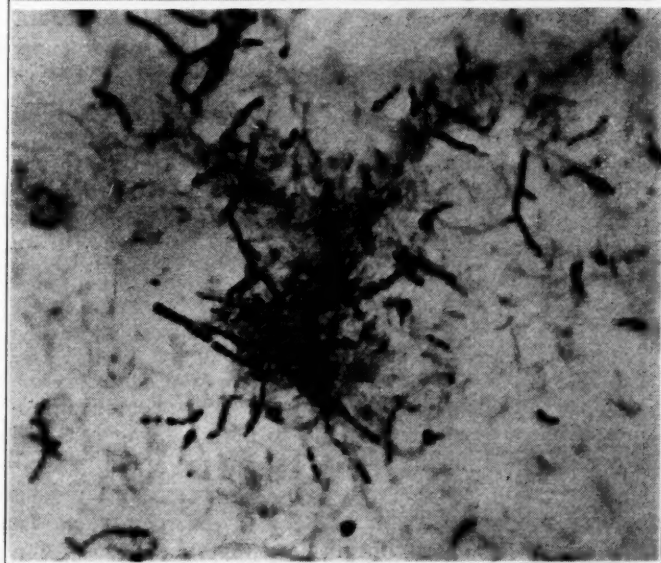


FIG. 7 (above). Smear preparation of culture of *Bacterium tuberculosis* (158 days).

FIG. 8 (below). Smear preparation of culture of *Bacterium tuberculosis* (188 days).

volved in loss of outline and disintegration. Three separate colonies were studied and all had the same characteristics.

The larger colonies grown on Dorset's glycerin-egg showed a different architecture. Their central portion was mostly constructed of distorted pillars, with spaces or vacuoles here and there. The loss of acid fastness of the organisms in these pillars was extreme. Where distortion was the greatest, particularly around the vacuoles, the structure was composed of a deep blue, gelatinous mass, the adjoining part being lighter blue and containing some more deeply stained acid-fasts. In this lighter part were non-acid-fasts in the various stages from clear outline to final disintegration, their shapes suggesting that the vegetative forms were involved. The lowest layer was the least involved in these color changes and disintegration. The organisms in contact with the medium, as in the smaller colonies, were thread-like, but contained a number of beads, or contractions of their protoplasm.

In making these colony sections, difficulty was encountered in that the agar, used to embed the colonies on their supporting media, fractioned in the cutting on the freezing microtome and was lost in the water before the sections could be floated onto the slides; the colonies were thus left without proper support.

Kahn⁵ suggests that the non-acid-fast rods and granules found in cultures on both solid and liquid media are the immature forms of *B. tuberculosis*.

Although the studies described in this paper are at variance with Kahn's suggestion, there has been no intention to convey the impression that all instances in loss of acid-fastness by the various morphological forms of *B. tuberculosis* are followed by death and disintegration.

SUMMARY

The foregoing studies were entered into with no other definite end in view other than to try to obtain a knowledge of the morphological variation of *B. tuberculosis*. The pleomorphic strain was chosen because of the possibility of obtaining a foundation which covered a wide morphological range, and it is possible that further cyclic changes might have been encountered had the culture been followed further. The study of colony sections was undertaken with a view to obtaining some knowledge of the relationship of the morphological forms, and the color changes with mass disintegration of the organisms to the architecture of the colony or massive cultural growth. No very definite knowledge was obtained of morphological relationship, since the sectional

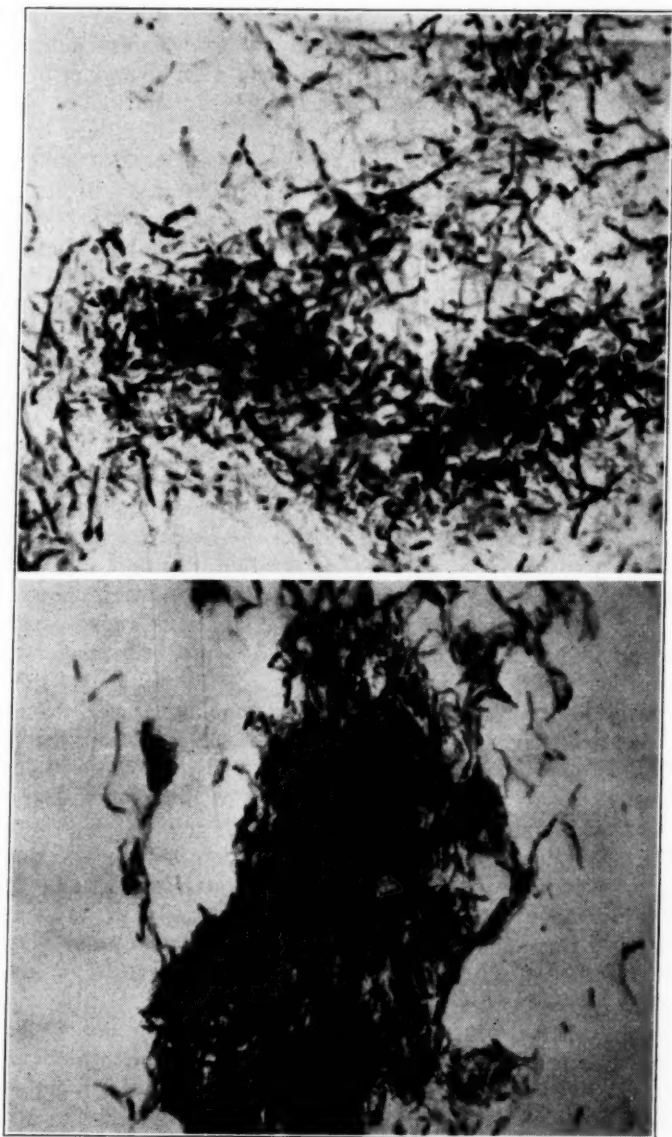


FIG. 9 (above). Smear preparation of culture of *Bacterium tuberculosis* (188 days). Secondary colony.
FIG. 10 (below). Smear preparation of culture of *Bacterium tuberculosis* (221 days).

colonies were of a different strain and of only 40 days growth. Also the organisms in a massive cultural growth are subjected to different conditions in respect to food supply and crowding than those in small colonies. A possible explanation of death and disintegration is presented in the distorted pillars of the colony sections, since the small and the large colonies gave evidence of similar architecture during their 40 days of growth. The suggestion is that owing to a more favorable food supply, the colonies on the glycerin-egg were more advanced, but had previously the same stone-wall-like construction of the smaller colonies. To illustrate this, say we make a pile of balls of dough in the shape of the smaller colony. Then, when the dough has risen the required amount, bake it. Thus, when cut in cross section, the picture presented would be that the surface portions would retain more or less of their original shape, but those in the center during the process of enlargement had become distorted into pillar-like shapes. The color changes and disintegration taking place in these central parts were no doubt influenced to a considerable extent by changes in the essential food supply, together with the distortion and possible injury to the more delicate vegetative bacterial forms. It is also reasonable to suppose that rather similar conditions of distortion by pressure and variation in supply of food material take place in massive cultural growth with similar results.

A satisfactory plan for study of morphological variation and the accompanying non-acid-fast changes could perhaps be more fruitfully followed by taking vertical sections of colonies, vertical sections of massive growth, and smears of both, at suitable intervals throughout a long period of cultural growth. The vertical sections are, in general, too dense for detailed observation of the morphological forms, but since such sections usually suffer a certain amount of damage, the broken edges provide a means of locating them in the colony or cultural growth structure, the more detailed study being made on the smears. The studies which have been described of the pleomorphic strain in this paper suggest that in this particular instance the range of morphological variation is favored by culture media which afford luxuriant growth. A perusal of the literature affords sufficient grounds for the belief that the human, bovine and avian strains differ sufficiently in the morphological range of their organisms to warrant a complete study and recording up to the limit of the range each strain is capable of producing.

In so many other diseases, the preventive or curative remedy has depended upon a full knowledge of the life cycle of the causa-

tive organism. We, as yet, do not possess such knowledge of the life cycle of *B. tuberculosis* or definite information in regard to symbiosis of the various members of the acid-fast group or of non-acid-fasts which have been found in close association with this disease.

Holman,⁶ in his publication on "Bacterial Associations," has compiled a great deal of information on the beneficial and antagonistic association of pathogenic and other bacteria, and states:

I would finally urge, after reading Claude Bernard's "Introduction to the Study of Experimental Medicine" and in attempting to get working hypotheses for the phenomena of bacterial association, that more and more attention be paid to the physiology of bacteria as reactive, living beings with as complicated metabolisms as our own, and that the study of their pathology, if such we may call it, requires this preliminary knowledge of the normal limits of their physiological activities, alone and together, in the test-tube and in the animal body. Thus we may be able to understand better many phenomena which at present cause confusion, and may better appreciate the basic principles in many of the biological activities of bacteria.

In concluding this paper may I express my respect and appreciation of the author just quoted, Dr. W. L. Holman, of the Department of Pathology and Bacteriology, University of Toronto, under whose guidance and kindly constructive criticism the postgraduate work was conducted.

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⁷Bernard, C.: *Op. cit.* Translation by H. C. Greene. (The Macmillan Co., New York, 1927.)

PRESIDENT SMITH: Dr. Bond, we thank you for that paper. It is an exhaustive study of a very important subject, and I am sure it will be a very valuable contribution to our records. This organization is noted for having a headliner, and I think all will agree with me that this year we have listened to a splendid paper to close our program.

We have a few other committee reports, which we will call for at this time. Dr. J. L. Axby is chairman of the Committee on Tuberculosis. He will present his report, which has been accepted and acted upon by the Executive Committee.

DR. AXBY: If you will bear with me just a minute, I personally want to thank the members with whom I have been associated this past year, comprising the Committee on Tuberculosis. I wrote to them,

asking for their opinions; and out of those opinions, coupled with my own, came the program which we have furnished you. Leaving myself out of consideration, Mr. President, I can sincerely say that when you selected this Committee your faith was well founded. They have delivered the goods.

You know, I am about 99.99 per cent English, and I think I am a charter member of the Kiwanis International, and have had a rather kindly feeling as the result of some instruction I had given to me when I was a boy in the common school, to endeavor to appreciate the absolute friendliness that existed for so many years between the United States and Canada. Upon entering into correspondence with the members of this Association who reside in Canada, I found them extremely friendly and coöperative. I expected that, and out of that came this contribution by Dr. Bond.

To this Committee I want to extend my thanks and, Dr. Bond, we want you to know we appreciate the amount of work that was necessary to prepare a paper on a subject like that which you have just delivered.

. . . Dr. Axby then read the report. . . .

REPORT OF THE COMMITTEE ON TUBERCULOSIS

Dr. J. L. AXBY, *Chairman*, Indianapolis, Ind.

Dr. A. E. Cameron, Ottawa, Can. Dr. H. D. Port, Cheyenne, Wyo.
Dr. E. T. Faulder, Albany, N. Y. Dr. H. A. Seidell, Des Moines, Iowa
Dr. C. C. Hisel, Oklahoma City, Dr. A. E. Wight, Washington, D. C.
Okla.

During the 1936 meeting of this Association, this Committee made certain recommendations which were adopted, but following which no action was taken. Therefore, this Committee again recommends to the Bureau of Animal Industry that the use of T. E. Form 15-C be discontinued and that laymen other than live stock sanitary officials be prohibited from issuing certificates for the interstate movement of live stock.

Dr. AXBY (continuing): I move the adoption of this report, Mr. President.

. . . The motion was seconded, voted upon and carried unanimously.

PRESIDENT SMITH: The next report is that of the Committee on Resolutions. Dr. Jacob, at the beginning of our meeting, asked to be relieved of the chairmanship of this Committee because he could not be here, and in his stead we appointed Dr. D. M. Campbell. We will hear from Dr. Campbell at this time.

. . . Dr. Campbell presented the following resolutions:

REPORT OF THE COMMITTEE ON RESOLUTIONS

RESOLUTION 1

WHEREAS, Trichinosis in swine is considered of vital importance to the health of the public and at the same time is of vital importance to the agricultural interests of the nation because of the possibility of jeopardizing the interests of the American swine-producer and lessening the use of wholesome pork and pork products, and

WHEREAS, The control of trichinosis represents a responsibility of state live stock sanitary officials from the standpoint of protecting the health of live stock, and of public health officials from the standpoint

of protecting the health of the people, and it also represents a dual responsibility of these agents for maintaining sanitary supervision of commercial hog feeding in territory under their respective jurisdictions, and

WHEREAS, It is known that the feeding of raw garbage is a medium through which trichinosis is conveyed to the highest percentage of infested animals, and

WHEREAS, Any systematic approach to the subject should avoid misleading or alarming publicity which can at best but have the effect of lessening the confidence of the public in pork and pork products; therefore be it

Resolved, That this Association acknowledges a responsibility for coöperating with the officials concerned, to the end that a program, both scientific and practical, be inaugurated for protecting swine from infestation with trichinosis; and be it further

Resolved, That it urges its members to coöperate with public health officials in carrying out their immediate responsibility in the control of known sources of infestation; and be it still further

Resolved, That they urge caution in the publicity aspects of any adopted program.

RESOLUTION 2

WHEREAS, The eradication and control of animal diseases in the United States has progressed to the present state of effectiveness only through great public effort and cost, and

WHEREAS, Foot-and-mouth disease as well as other diseases not now indigenous in this country have in the past caused great economic losses and individual sacrifices on the part of the live stock industry of our country, and

WHEREAS, The present outbreak of foot-and-mouth disease in Europe, involving at latest reports (November 5, 1937) more than 2,000 centers of infection in Germany; 3,573 in Belgium and more than 4,000 in France, started by imports from countries in which the disease is indigenous, has shown its capacity to break through the strongest live stock sanitary cordons along the channels of commerce in animals and animal products; therefore be it

Resolved, That this Association unalterably opposes the establishment of commercial relations with any nation in which foot-and-mouth disease is indigenous, of a nature permitting the importation of products likely to introduce or capable of introducing this disease in the United States; and be it further

Resolved, That this Association strongly urges the continued maintenance of such sanitary restrictions as will adequately and completely safeguard the live stock industry of the United States against the introduction into this country from any foreign country of any communicable diseases of animals.

RESOLUTION 3

WHEREAS, Bang's disease exacts a large annual economic toll from the cattle industry of our nation and creates also a human health problem which is being seriously studied by scientists and health officials to evaluate its intrinsic effects, and

WHEREAS, Bang's disease can be controlled and eradicated with means now available, and

WHEREAS, The control and eradication of Bang's disease has been greatly extended throughout the nation in recent years under the coöperative program between the federal government and the various states, and

WHEREAS, To protect the work already done it is necessary to continue the campaign against this disease on a basis where continued progress in increasing proportions will obtain; therefore be it

Resolved, That the United States Live Stock Sanitary Association, in annual convention assembled at Chicago, Illinois, December 1-3, 1937, urge upon the Congress and the various states the appropriation of adequate funds to enable the carrying on of the Bang's disease control program in the most practical, scientific, economic and efficient manner; and be it further

Resolved, That a copy of this resolution be sent to every member of the Congress of the United States.

RESOLUTION 4

WHEREAS, The pullorum disease phase of the National Poultry Improvement Plan represents a vital part of the National Poultry Improvement Plan, and

WHEREAS, The nature of the pullorum disease control requires a personnel with training and experience in animal diseases; therefore be it

Resolved, That the United States Live Stock Sanitary Association suggest that the Chief of the Bureau of Animal Industry, United States Department of Agriculture, designate and announce on the National Poultry Improvement Plan a personnel with a training and experience in animal diseases and in the control and eradication of such diseases, to supervise the pullorum disease phase of the National Poultry Improvement Plan; and be it further

Resolved, That this resolution be amended to provide that all official testing under the National Poultry Improvement Plan for the control or elimination or eradication of pullorum disease be performed by trained veterinarians or trained laboratory technicians; and be it further

Resolved, That a copy of this resolution be forwarded to the Secretary of Agriculture, Washington, D. C.

DR. CAMPBELL: This concludes the Committee's report. (Applause)
 . . . Separate motions prevailed adopting each of the four resolutions. . . .

PRESIDENT SMITH: It has been called to my attention that last year the Executive Committee appointed a committee of which Dr. Wm. Moore was the Chairman, to report on the unification of health certificates. Dr. Moore has left, but he reported progress. Unless there is an objection, we will continue this Committee on the Unification of Health Certificates, and shall put their report over until 1938. Hearing no objection, that Committee shall be continued in force as now constituted.

The next committee to report is the Committee on Policy. Dr. W. J. Butler, the Chairman, does not seem to be here.

. . . Secretary Day read the report. . . .

REPORT OF THE COMMITTEE ON POLICY

DR. W. J. BUTLER, *Chairman*, Helena, Mont.

Dr. Adolph Eichhorn, Pearl River, N. Y. Dr. John R. Mohler, Washington, D. C.

Dr. W. A. Hagan, Ithaca, N. Y. Dr. L. Van Es, Lincoln, Neb.

The policy of this Association has been very thoroughly outlined in previous reports.

We desire to call your attention, however, to the growing tendency to get away from the fundamental principles upon which this Association was organized. This Association was organized by regulatory officials as a regulatory organization to be used for the dissemination of all information relative to the control and eradication of infectious-contagious or dangerous diseases of live stock, which word we also interpret to include poultry. This organization was also to act as a mediator for the codification and unification of rules and regulations governing methods to be used for the extirpation and control of infectious-contagious and dangerous diseases as well as for the unification of regulations governing the interstate movement of live stock.

The various papers that were presented at this meeting and at previous meetings have been exceptionally good and we extend to the various speakers who have appeared upon our program our very sincere appreciation.

We desire, however, to call the Association's attention to the fact that we are apparently losing sight of the principal objects of this organization, and that regulatory matters and matters pertaining more vitally to the understanding of the methods to be used in the control of important dangerous live stock conditions and for the prevention of disease conditions in live stock are not receiving first consideration.

We recommend to the Association that such subjects do receive first consideration on all future programs and discussions.

We also recommend to the members of the United States Live Stock Sanitary Association that they authorize the publication of a monthly report of disease conditions in the various states in the United States as well as in neighboring countries and countries from which we may receive live stock or meat products, and also to act as a disseminator of regulations of interest to regulatory officers. We also recommend that this Association request that the U. S. Bureau of Animal Industry establish a division of vital statistics for live stock.

SECRETARY DAY: I move the adoption of this report.

. . . The motion was seconded, voted upon and carried unanimously. . . .

SECRETARY DAY: There is a question pertaining to this report that I should like to mention at this time. Our programs are becoming so extremely full that it is hard to get through with the program in three days. Therefore, I would like someone to make a motion at this time that we eliminate all committee programs to three papers and that they be limited to not over 30 minutes each. If we can do that, I believe we will then be able to finish our program without overcrowding it.

PRESIDENT SMITH: I hardly believe that is necessary, Dr. Day. Article VI of our Constitution and By-Laws reads as follows:

"The Program Committee: The President and Chairman of the Executive Committee and the Secretary-Treasurer shall constitute the Program Committee. It shall be the duty of the Program Committee to make the necessary arrangements and provide the program for the annual and special meetings."

It would seem to me that they have plenty of authority to go ahead and do as they see fit.

SECRETARY DAY: I merely wanted the sanction of the organization to limit the committees to three papers; that's all.

. . . The question was put to a vote, and all members but two approved of the plan submitted by Secretary Day. . . .

PRESIDENT SMITH: The matter will be left to the discretion of the Program Committee.

While we are on this subject, it might be well for us to take just a minute to read the purposes of this Association. To me it does not

seem that any of our programs in the past have transgressed much from what our Constitution and By-Laws provide. Article II, entitled "Purposes," reads:

"The purpose of this Association shall be the study of live stock sanitary science, milk and meat hygiene, and the dissemination of information relating thereto. Unification so far as possible of the laws, regulations, policies and methods pertaining to milk and meat hygiene and to the prevention, control and eradication of transmissible live stock diseases; to maintain coördination among the various live stock regulatory organizations; and to serve as a live stock sanitary science clearing house between this Association and the following: the live stock owner; the live stock sanitarian; the milk and meat hygienist; the veterinary practitioner; the transportation and stockyard companies; the milk and meat producing and distributing companies; and various other interested agencies.

"The words 'live stock' as herein used shall be understood to include poultry."

DR. CAMPBELL: Mr. President, while we are looking upon those matters, I want to comment for half a minute on the report of the Committee on Policy, which outlined the purpose for which this Association was organized.

The actual purpose for which this Association was organized was to go to Fort Worth and inspect a cattle dipping-vat and see it in operation. (Laughter)

PRESIDENT SMITH: Thank you. That's true; history so states.

The next is a report of the Committee on Tick Eradication. It will be presented by Dr. T. O. Booth, Chairman, of Fort Worth, Texas.

. . . Dr. Booth read the report. . . .

REPORT OF THE COMMITTEE ON TICK ERADICATION

DR. T. O. BOOTH, *Chairman*, Fort Worth, Texas

Dr. W. M. MacKellar, Washington, D. C.	Dr. J. V. Knapp, Tallahassee, Fla. Dr. E. S. Brashier, Jackson, Miss.
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Dr. W. K. Lewis, Columbia, S. C.

The systematic drive to eliminate the cattle-fever tick from infested areas in the United States was continued throughout the year, the net result of the season's work being a reduction of 9,287 square miles of quarantined territory located in the states of Florida and Texas, and the requarantine of 2,248 square miles in Florida. This action is covered in B. A. I. Order 363, effective December 1, 1937, which order releases from federal quarantine in Texas the counties of Duval, Harris, Houston, Montgomery and San Jacinto, the remainder of Brazoria, and parts of Cameron, Chambers, Hidalgo, Liberty and Nacogdoches, and in Florida, Charlotte County. This order also requarantines parts of Collier, Glades and Highlands counties in Florida, and continues the quarantine in the territory of Puerto Rico.

Last spring, systematic tick eradication was inaugurated by the Texas Live Stock Sanitary Commission in 14 East Texas counties, which constituted the last inactive tick-infested area in continental United States. Also, due to assistance rendered by the Puerto Rico Reconstruction Administration, the necessary dipping equipment was furnished and systematic dipping undertaken this season in the western one-third of the island of Puerto Rico, and preliminary work is being continued in the remainder of the island.

Progress was also made in the final clean-up in the released area, with the result that Arkansas and Mississippi at the close of the year joined the list of states in which no known infestation remains, thus making twelve of the 15 originally tick-infested states completely free from fever-tick infestation.

The requarantine of areas in Florida was made necessary by the continuation of tick infestation in certain swampy sections of central Florida because of the tropical variety of fever tick propagating on deer. For several years it has been apparent to the cooperating authorities in Florida that the completion of the project would depend on the application of proper control measures to deer which are perpetuating the fever tick (*Boophilus annulatus* var. *australis*). To provide the necessary measures permitting the removal of the deer from these restricted areas, special state legislation was recommended by the Florida Live Stock Sanitary Board and passed at the last session of the State Legislature. However, through the efforts of the Florida sportsmen, the State Board has been temporarily enjoined from carrying out the provisions of these special laws and the question of reducing the number of deer in the tick-infested swamps has been taken

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Animal Industry
Washington, D. C.

Progress in Tick Eradication—July 1, 1906, to December 1, 1937

STATE	COUNTIES QUARANTINED ON JULY, 1906	COUNTIES QUARANTINED ON DEC. 1, 1937		COUNTIES RELEASED TO DEC. 1, 1937		AREA QUARANTINED ON JULY 1, 1906	AREA QUARANTINED ON DEC. 1, 1937	AREA RELEASED TO DEC. 1, 1937	
		WHOLE	PART	WHOLE	PART	SQUARE MILES	SQUARE MILES	SQUARE MILES	PER CENT
Alabama	67	0	0	67	0	51,279	0	51,279	100
Arkansas	75	0	0	75	0	52,525	0	52,525	100
California	15	0	0	15	0	79,924	0	79,924	100
Florida	67	4	3	60	3	54,861	6,741	48,120	88
Georgia	158	0	0	158	0	57,438	0	57,438	100
Kentucky	2	0	0	2	0	841	0	841	100
Louisiana	64	0	0	64	0	45,409	0	45,409	100
Mississippi	82	0	0	82	0	46,362	0	46,362	100
Missouri	4	0	0	4	0	1,386	0	1,386	100
No. Carolina	73	0	0	73	0	37,365	0	37,365	100
Oklahoma	61	0	0	61	0	47,890	0	47,890	100
So. Carolina	46	0	0	46	0	30,495	0	30,495	100
Tennessee	42	0	0	42	0	16,987	0	16,987	100
Texas	198	15	6	177	6	191,885	18,651	173,234	90
Virginia	31	0	0	31	0	13,918	0	13,918	100
Totals	985	19	9	957	9	728,565	25,392	703,173	96

Area released December 1, 1937..... 9,287 square miles

Area requarantined December 1, 1937..... 2,248 square miles

(Aug. 15, 1937, 1,140 square miles released in Texas, making a total net area released during the calendar year 1937 of 8,179 square miles)

into the courts. The problem of completing tick eradication in Florida will continue until this question is definitely disposed of and legal provisions are made for handling infested deer.

For the records of the Association, there is attached herewith copy of the Bureau of Animal Industry's statement showing progress in tick eradication from July 1, 1906, to December 1, 1937.

PRESIDENT SMITH: This report was presented to and acted upon by the Executive Committee. If you gentlemen wish to take a chance, we will vote on its acceptance now. Will someone make a motion to that effect?

HON. RIORDAN: As the report went through the Executive Committee, Mr. President, I move that we accept the action of that body.

. . . The motion was seconded, voted upon and carried unanimously. . . .

PRESIDENT SMITH: Is there any unfinished business, Mr. Secretary?

SECRETARY DAY: Not that I know of.

PRESIDENT SMITH: Is there any new business other than the election of officers?

Dr. Faulder, will you give us the report of the Nominating Committee?

ELECTION OF OFFICERS

DR. FAULDER: Mr. President, and members of the Association, our report follows the procedure of previous years:

The Nominating Committee now makes the following recommendations for the election of officers for the ensuing year:

For President: Dr. D. E. Westmorland, of Kentucky.

For First Vice-President: Dr. J. Leonard Axby, of Indiana.

For Second Vice-President: Dr. H. D. Port, of Wyoming.

For Third Vice-President: Dr. E. A. Crossman, of Massachusetts. (Applause)

PRESIDENT SMITH: Gentlemen, you have heard the report of the Nominating Committee. What is your pleasure?

HON. RIORDAN: I move its adoption.

. . . The motion was seconded, voted upon and carried unanimously. . . .

DR. HAYES: I move that nominations be closed and that the Secretary be instructed to cast a unanimous ballot for the nominees. (Applause)

. . . The motion was seconded, voted upon and carried unanimously. Secretary Day cast the unanimous ballot for the nominees for the year 1938. . . . (Applause)

PRESIDENT SMITH: Gentlemen, behold your officers!

It is with pleasure and also not grief but regret that at this time I turn over my duties as President of this organization to you, gentlemen and to you, Dr. Westmorland.

During the past year, I have enjoyed every minute that I have spent in the work of this organization. These first three men, Dr. Westmorland, Dr. Axby and Dr. Port, have assisted Dr. Day and myself in every respect when we have called upon them, and I am sure that you have no need to worry about the conduct of the duties of this organization during the next year.

Dr. Westmorland, while I do regret that I am ending my term of office, it is with great pleasure that I welcome you to the President's chair and offer you this gavel. (Applause)

. . . President Smith retired and Dr. Westmorland assumed the presidency. . . .

My good friend Dr. Axby needs no introduction. He has not been a member, or an active member, perhaps, as long as Dr. Westmorland or Dr. Port, but since he has been here he has been very active, and it gives me great pleasure to greet you as First Vice-President, Dr. Axby.

To Dr. Port, it gives me exceeding pleasure for the reason that you and I spent two years together in college. He graduated a year ahead of me, and when I came out here, 14 or 16 years ago, I was very much pleased to meet him. Dr. Port, I welcome you. (Applause)

Dr. Crossman, as you know, has been associated with me for 16 years in tuberculosis eradication work in New Hampshire. To you, Dr. Crossman, I extend my welcome as Third Vice-President of this organization. (Applause)

PRESIDENT WESTMORLAND: Gentlemen, words will not express my appreciation for the honor you have bestowed upon me. I can say only that I shall exert every effort in the interests of this Association during the next year.

Associated with me are the officers whom I am sure will cooperate with me in every way. We ask the individual cooperation of every member of this Association. That is essential if we are to carry out our program this coming year.

We might call upon Dr. Axby, who is the orator of the veterinary profession in America, to address us for a few moments. (Applause)

DR. AXBY: Mr. President, I cannot refrain from saying to you that as the hands of the clock of time have revolved, and I have become better acquainted with the membership of this Association, I have more greatly appreciated that acquaintanceship. I have had the honor to be associated with several men since I started at the bottom of the ladder, and I am very proud of that association. I shall never forget those associations, and in that this is fresh in my mind I am especially proud of Dr. Smith. My relations with him have not only been cordial at all times, but I have always found him equal to the occasion.

I do know that in my humble way, in my humble capacity I have and shall continue to serve you in any capacity you choose for me. I shall render the best service possible of me. I shall never be unmindful of the purposes and aims that brought this Association into being. May I say that, appreciating the aims and purposes and personnel of this Association, I hope that the influences, the sanitary influences of this Association, if it be possible to bound them, shall go out and go on until they cover an area so vast that if you were to bound it you could but say that it is bounded on the North by the Aurora Borealis, on the South by the equinoxes, on the East by the rising sun and on the West by the Judgment Day.

I promise that I shall contribute my best efforts during this next year to make this Association a success. For the honor you have conferred upon me I am very appreciative.

I thank you. (Applause)

PRESIDENT WESTMORLAND: We will have a word from Dr. Port.

DR. PORT: Mr. President and members, I am by no means a public speaker, but I will take this opportunity to say that I am glad to co-

öperate with the officers over me, and shall assist them in every way possible to continue to make this Association a success.

Thank you. (Applause)

PRESIDENT WESTMORLAND: Dr. Crossman. (Applause)

DR. CROSSMAN: Mr. President, Mr. Past-President, and members, I appreciate the confidence you have in me to elect me Third Vice-President of this Association. Up to the past two years it has been rather a bad omen to be elected Third Vice-President, because that has been a process of elimination. Up to within a couple of years, our Third Vice-Presidents have failed to come back again.

I hope that I shall be with you next year. It would appear that the New England States, the Atlantic Seaboard States, needed a representation at this meeting. We don't want to dictate, but we don't wish to be left out in the cold.

I was paying a bill down in the lobby, and Charlie Cotton came along and said, "This fellow won't give you any more than is coming to you, but he won't cheat you." And that is the attitude of the Yankees back in New England.

I hope to come here again next year. I hope to be of some benefit to you during the coming year. (Applause)

PRESIDENT WESTMORLAND: Thank you, Dr. Crossman.

There are two committees to be appointed. One of them is on meat inspection of poultry. This committee will be appointed later today.

The other committee is the committee of five to coöperate with the A. V. M. A. committee on this public health unit. That committee, also, will be appointed later.

DR. AXBY: Mr. President, at this time the thought comes to me that we have had the opportunity of coming here to the Hotel La Salle and finding many fine improvements. We have had the privilege of being the first organization to meet in this new auditorium. My personal reaction (and I think perhaps that I voice the sentiment of others) is that it would be only right and proper for us to extend our thanks to the Hotel La Salle for the hospitality which has been extended to us while here.

I make that as a motion.

DR. SMITH: I second the motion.

PRESIDENT WESTMORLAND: A rising vote of thanks for the courtesy and hospitality of the Hotel La Salle during our stay with them is in order.

. . . The audience arose and applauded. . . .

PRESIDENT WESTMORELAND: Is there anything else to come before this convention?

DR. SMITH: Mr. President, I think we should extend to Dr. Day our appreciation for his untiring efforts. I can truthfully say that because of Dr. Day's thoughtfulness the office of President has been made comparatively easy.

I move that we give Dr. Day a rising vote of thanks.

DR. AXBY: I second the motion.

. . . The audience arose and applauded. . . .

DR. SMITH: Mr. President, if there is no further business, I move we adjourn.

. . . The motion was seconded, voted upon and carried unanimously, and the meeting adjourned *sine die* at 4:20 p. m. . . .

ADJOURNMENT

FINANCIAL STATEMENT

L. ENOS DAY, *Secretary-Treasurer*

RECEIPTS

Membership dues, 185 @ \$2.00	\$ 370.00
Members paying current and back dues, 1 @ \$6.00	6.00
Members paying current and 1938 dues, 1 @ \$4.00	4.00
State memberships, 45 @ \$25.00	1,125.00
County of Los Angeles..	25.00
Reports sold: U. S. B. A. I.	\$75.00
Canada Dept. Agr.	50.00
Miscellaneous ...	3.00
	128.00
Interest on U. S. Bonds and Treas. Certificates.	172.30
Interest on California Warrant84
Total receipts	\$1,831.14
Cash balance, Nov. 19 1936	2,302.81
	\$4,133.95

DISBURSEMENTS

Exchange on checks and securities in safe keep- ing	\$ 10.08
Postage and express....	72.53
Clerical hire	5.00
Office rent	20.00
Reporting meeting	134.04
Printing	701.41
Miscellaneous	132.75
Salary, Sec'y-Treas.	600.00
Total disbursements ...	\$1,675.81
Cash balance, Nov. 19, 1937	2,458.14
	\$4,133.95

CURRENT ASSETS—U. S. Treasury Certificates.....	\$2,300.00
U. S. Bonds	2,900.00
Cash balance in bank.....	2,458.14
	\$7,658.14

LIABILITIES—None.

STATE MEMBERSHIPS

Alabama	Iowa	Nebraska	South Carolina
Arizona	Kansas	Nevada	South Dakota
Arkansas	Kentucky	New Hampshire	Tennessee
California	Louisiana	New Mexico	Texas
Colorado	Maine	New Jersey	Utah
Connecticut	Maryland	New York	Virginia
Delaware	Massachusetts	North Carolina	Vermont
Florida	Michigan	North Dakota	Washington
Idaho	Minnesota	Ohio	West Virginia
Illinois	Missouri	Oklahoma	Wisconsin
Indiana	Mississippi	Pennsylvania	Wyoming
	Montana	Rhode Island	
	Los Angeles County, Calif.		
	U. S. Bureau of Animal Industry		
	Canada Department of Agriculture		

November 19, 1937.

UNITED STATES LIVE STOCK SANITARY
ASSOCIATION

Officers, 1937-1938

PRESIDENT

Dr. D. E. Westmorland
Frankfort, Ky.

VICE-PRESIDENTS

Dr. J. L. Axby, *1st Vice-President*, Indianapolis, Ind.
Dr. H. D. Port, *2nd Vice-President*, Cheyenne, Wyo.
Dr. E. A. Crossman, *3rd Vice-President*, Boston, Mass.

SECRETARY-TREASURER

Dr. L. Enos Day
3933 Drexel Boulevard
Chicago, Ill.

42nd
Annual Meeting

United States
Live Stock
Sanitary Association

Hotel La Salle, Chicago
November 30—December 1-2
1938



Regular Army

Colonel Alfred L. Mason is relieved from assignment and duty at headquarters, Ninth Corps Area; from additional duty as station veterinarian, Presidio of San Francisco; attending veterinarian at Hamilton Field (San Rafael), Fort McDowell, Letterman General Hospital, and Leland Stanford Junior University, Stanford University, effective on or about August 1, 1938, and directed to proceed to Fort Bliss, Texas, for duty.

Lt. Colonel Daniel S. Robertson is assigned to duty at Fort George G. Meade, Md., effective upon completion of his present tour of foreign service in the Philippine Department.

Lt. Colonel Fred C. Waters is relieved from duty at the Seattle Quartermaster Depot, Seattle, Wash., and from additional duty as attending veterinarian at Fort Lawton and Fort Worden, Wash., effective at such time as will enable him to proceed to San Francisco, Calif., and sail on transport scheduled to leave that port on or about April 19, 1938, for the Philippine Department for duty with the Veterinary Corps.

Lt. Colonel Floyd C. Sager is relieved from duty at the Front Royal Quartermaster Depot, Front Royal, Va., and from additional duty as assistant to the commanding officer, Front Royal Remount Area, effective at such time as will enable him to proceed to New York, and sail on or about May 26, 1938, via government transportation, for the Philippine Department, upon arrival to report to the commanding general for assignment to duty with the Veterinary Corps.

1st Lieut. Walter T. Carl is directed to report at the proper time to the commandant, Chemical Warfare School, Edgewood Arsenal, Md., for temporary duty for the purpose of attending the Line and Staff Officers Course to be held from February 6 to April 30, 1938, upon completion to return to his proper duties at Fort Hoyle, Md.

Veterinary Corps Reserve

NEW ACCEPTANCES

Hawkins, Thomas Hudson...1st Lt...1957 Lipscomb St., Fort Worth, Texas.
 McKinney, Edgar Belton, Jr...1st Lt...803 N. Spring St., Murfreesboro, Tenn.
 Madsen, Peter Edgar.....1st Lt...P. O. Box 631, Sheridan, Wyo.

PROMOTIONS

To

Milks, Clifford Howard.....1st Lt...Brook St., Newark Valley, N. Y.
 Mims, Joseph Bryan.....1st Lt...306 S. Anglin St., Cleburne, Texas.

SEPARATIONS

Smith, Esmond Verle.....1st Lt...Puyallup, Wash. (Died in an automobile accident May 1, 1937.)

NEW ASSIGNMENTS TO ACTIVE DUTY WITH CCC

Cook, Robert W.....1st Lt...Chicago Q. M. Depot.
 Eggert, William E., Jr.....1st Lt...Trenton, N. J.
 Versluis, Hendrik1st Lt...Trenton, N. J.

TERMINATION OF ASSIGNMENT TO ACTIVE DUTY WITH CCC

Erlich, David1st Lt...Trenton, N. J.
 Krukowski, Stanley1st Lt...Trenton, N. J.
 Reese, William C.....1st Lt...Binghamton, N. J.
 Shaner, Ralph1st Lt...Schenectady, N. Y.
 Wiseman, Edwin Stranel....1st Lt...Towson, Md.
 Wann, Russell S.....1st Lt...Camp Beauregard, La.
 Martin, Earl Thompson.....Capt...Fort Leavenworth, Kan.
 Mydland, Halder Thomas....1st Lt...Fort Leavenworth, Kan.
 Peterson. Harold O1st Lt...Pocatello, Idaho.

United States Civil Service Examination

The United States Civil Service Commission announces the following open competitive examination:

JUNIOR VETERINARIAN

Applications for this examination must be on file with the United States Civil Service Commission, at Washington, D. C., not later than March 28, 1938 (east of Rocky Mountains), or March 31, 1938, for western points. This examination is to fill vacancies in the Bureau of Animal Industry, U. S. Department of Agriculture, at a salary of \$2,000 a year, which is subject to a deduction of 3½ per cent toward a retirement annuity.

Applicants must have been graduated from a veterinary college of recognized standing, or be senior students in such an institution, and furnish proof of graduation, before active duty can be assumed, even though certification has been previously given.

Competitors will be rated on veterinary anatomy, physiology and pathology, meat inspection, and theory and practice of veterinary medicine.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., from the secretary of the Board of U. S. Civil Service Examiners, at any first-class post office, or from any United States Civil Service district office.

NECROLOGY



ORION E. DYSON

Dr. Orion E. Dyson died in Saint Petersburg, Fla., January 30, 1938. He had been in failing health for several years and his death was not unexpected.

Born in Rushville, Ill., August 28, 1865, Dr. Dyson attended local schools and planned to enter the field of journalism. However, being a great lover of animals, he decided to study veterinary medicine and entered the Chicago Veterinary College. Following his graduation in 1891, he returned to Rushville and practiced there for about two years. He then entered the employ of the U. S. Bureau of Animal Industry and was assigned to meat inspection at Chicago. He remained in the service until 1905, having been promoted in the meantime to the rank of inspector-in-charge.

In 1905, Dr. Dyson resigned from government service and for about eight years was located in Chicago in various capacities, most of the time as a consulting veterinarian. When Edward F. Dunne was elected governor of Illinois in 1912, he appointed Dr. Dyson as State Veterinarian, a position which he held until 1917. Then Dr. Dyson reentered the service of the U. S. Bureau of Animal Industry and remained in that work until 1936, when he was retired. During this latter period of service, he was identified with the Packers and Stock Yards Administration of the Department of Agriculture and was stationed at Kansas City, Saint Paul and Wichita.

Dr. Dyson joined the A. V. M. A. in 1907. He was a member of the Committee on Diseases (1907-08), of the Committee on Finance (1908-09), of the Committee on Local Arrangements for the meeting in Chicago in 1909, and of the Executive Committee (1913-15). He was a member of the Illinois State Veterinary Medical Association and of the United States Live Stock Sanitary Association. He joined the latter organization in 1907 and served as president for the year 1915-16, and later as secretary, 1922-1936.

To Dr. Dyson should go a large share of the credit for the idea of establishing tuberculosis-free herds of cattle by some system of accreditation. In a paper which he read before the United States Live Stock Sanitary Association at the meeting held in Chicago in 1910, he said:

* * * all herds which are free from tuberculosis and contagious abortion should receive official recognition from the state and federal authorities in order that the owner of the animal may receive just recognition in the breeding world.

Three years later, before the same organization, Dr. Dyson read another paper entitled, "Bovine Tuberculosis in Illinois. Modern Method of Handling in Purebred Herds." In this paper he outlined a plan which had been placed before the cattle-breeders of Illinois for classifying herds of purebred cattle that were entitled to official recognition for being free of tuberculosis. This plan provided for three classes, depending on the degree of freedom from the disease, based on one or more tuberculin tests.

Although the plan originally conceived by Dr. Dyson for eradicating bovine tuberculosis and establishing accredited tuberculosis-free herds is not the same as the one now in operation, the original idea was very much the same, and Dr. Dyson's vision should not be overlooked in giving credit for later accomplishments in the gigantic campaign of freeing the cattle herds in this country from tuberculosis.

GEORGE MCGILLIVRAY

Dr. George McGillivray, of Roseau, Minnesota, died February 3, 1938.

Born in Pickering, Ontario, Can., April 27, 1856, Dr. McGillivray located in Pipestone County, Minn. in the early 80's. He attended the Ontario Veterinary College and was graduated with the class of 1885. He practiced at Pipestone, Spring Valley and Roseau at various times. He had been a resident of Roseau since about 1893.

Dr. McGillivray joined the A. V. M. A. in 1902. He was a member of the Committee on Resolutions 1919-20. He was a member of the Minnesota State Veterinary Medical Society and served as president for the year 1907. He was a member of Quarry Lodge A. F. & A. M., of Pipestone. He is survived by two brothers and three sisters.

J. P. F.

ERNEST L. DUDGEON

Dr. E. L. Dudgeon, of Platte City, Mo., died on January 15, 1938, after a prolonged illness.

Born in Kentucky in 1883, Dr. Dudgeon attended the Western Veterinary College in Kansas City, Mo. He was graduated with the class of 1907, and located in Platte City, where he developed a very fine practice. He was so well thought of in his community that on the day of his funeral, the Mayor of Platte City issued a proclamation directing all places of business to remain closed for one hour.

Dr. Dudgeon joined the A. V. M. A. in 1928. He was a member of the Missouri Veterinary Medical Association.

SAMUEL CALHOUN NEFF

Dr. Samuel C. Neff, of Staunton, Va., died at his home on January 19, 1938, a victim of a paralytic stroke, at the age of 69 years.

Born in Waynesboro, Va., Dr. Neff obtained his veterinary education at the Ontario Veterinary College. He was graduated with the class of 1901, and had been engaged in veterinary practice ever since his graduation. For 34 years, he was a member of the Virginia State Board of Veterinary Examiners and served as its president for a number of terms.

Dr. Neff joined the A. V. M. A. in 1911. He is survived by his widow, one son, one daughter, two sisters and a brother.

A. J. S.

HORATIO A. SAILORS

Dr. H. A. Sailors, of Wabash, Ind., died in the Wabash County Hospital, February 5, 1938, following an illness of some months.

Born in Wabash County, Ind., January 9, 1883, Dr. Sailors received his early education in the Lincolnville schools. He then entered the McKillip Veterinary College and was graduated with the class of 1908. He practiced first in partnership with Dr. E. S. Hess (McK. '06), and for the past twelve years he had been in partnership with Dr. D. D. Baker (Iowa '23).

Dr. Sailors was a member of the Masonic Lodge, and a former member of the Knights of Pythias and Elks lodges. He is sur-

vived by his widow (née Maude Potter), one daughter, one son, his mother and one brother.

F. C. T.

HENRY W. ROEDER

Dr. Henry W. Roeder, of Axtell, Kan., died December 19, 1937. He was a graduate of the Kansas City Veterinary College, class of 1912, and was in general practice at Axtell.

AMOS ALVIN ARMSTRONG

Dr. Amos Armstrong, of Lincoln, Ill., was found dead in his automobile in the rear of his hospital, on February 10, 1938. Death was caused by carbon monoxide fumes.

Born in Logan County, October 13, 1883, Dr. Armstrong was a graduate of the Kansas City Veterinary College, class of 1912. He practiced first with Dr. T. A. Donald (K. C. V. C. '92), now of Lincoln, Ill. He had conducted the Lincoln Veterinary Hospital for about 15 years.

Surviving Dr. Armstrong are his widow (née Hilda Maurer), one daughter, his mother and a sister.

IRA W. EVANS

Dr. Ira W. Evans, of Beatrice, Neb., died at his home on May 22, 1937. Death was due to Hodgkin's disease, from which he had suffered for about five years. He had been confined to his bed for two years. He was a graduate of the Kansas City Veterinary College, class of 1915, and had been in general practice at Beatrice since graduation.

Approved

The American Animal Hospital Association, through its Committee on Foods, has approved four dog foods prepared by three manufacturers, according to a recent announcement. Each of the four foods has been granted the seal of approval of the A.A.H.A. For further information, write the Committee on Foods of the American Animal Hospital Association, Box 641, New Brunswick, N. J.